FIELD SUPPLEMENTATION TRIAL IN PREGNANT WOMEN WITH 60 MG, 120 MG AND 180 MG OF IRON WITH 500 μG OF FOLIC ACID

An ICMR Task Force Study

Indian Council of Medical Research
New Delhi
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FOREWORD

The Indian Council of Medical Research (ICMR), at the request of the Ministry of Health & Family Welfare conducted in 1987 an evaluation of the National Nutritional Anaemia Prophylaxis Programme (NNAPP) which showed that the programme was performing very poorly. One likely reason for this poor performance was the dose of the supplement for pregnant women then being used in the programme —60mg of elemental iron with 500 μg of folic acid given daily. The ICMR's Task Force on Nutritional Anaemia therefore recommended that a trial be undertaken in pregnant women using different doses of iron (60, 120 and 180mg) given daily under actual field conditions *i.e.* where intake of supplements is unsupervised, on a multicentric basis. The results of this six-centre study indicate that the dose of 120mg iron with 500 μg of folic acid given daily is probably the optimum dose under actual field conditions considering both the efficacy reflected by rise in haemoglobin, as well as the clinical side-effects in the users.

The interim results of this study had been discussed by a Scientific Expert Group of the Ministry of Health & Family Welfare in 1989. Based on the results of this study and experiences gained elsewhere in the world, the dose of iron has now been increased from 60 mg to 100 mg daily and the programme has been redesignated as the National Anaemia Control Programme.

We hope that this report will be of interest and use to nutritionists, public health programme managers, obstetricians & gynaecologists and to all those who are involved in ensuring a better future for mothers and children in our country.

S.P. Tripathy

(Dr. S.P. Tripathy)
Director-General

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1. INTRODUCTION

1.1 Prevalence

Nutritional anaemia is a problem of great magnitude the world over with a much higher frequency in the developing countries (1). Several studies have shown that 50 percent of preschool children in India are anaemic (2-4). Deficiency of iron is the most important pathogenetic factor in causation of this anaemia (12). In pregnant women, folate deficiency is also a contributing factor (12). Supplementation with iron and folate has been effective in reducing frequency of anaemia in them (5-7).

1.2 Supplementation studies in India

These studies in India showed that supervised oral administration of iron produced a significant rise in mean haemoglobin concentration in pregnant women (5-7). The magnitude of rise was greater when folic acid was added to the therapeutic regimens. Vitamin B_{12} did not contribute to this response (6, 7). Administration of placebo resulted in a significant fall in mean haemoglobin concentration in all these studies. Folic acid and/or vitamin B_{12} supplementation without iron showed no enhancement in mean haemoglobin values. The rise in haemoglobin concentration was significantly more with higher doses of iron (from 30 mg to 240 mg per day) in one of the studies (6). Parenteral iron administration both by intravenous and intramuscular routes showed similar effect. Rise in haemoglobin concentration was enhanced when oral folic acid administration was added to intramuscular iron therapy (6).

1.3 National Programme

In 1968 the Nutrition Society of India (NSI) constituted a study group to recommend measures to combat nutritional anaemia in the country. The group, based on the available information, recommended prophylactic administration of iron and folic acid to pregnant women (8). On the basis of this report the Ministry of Health and Family Welfare, Government of India, in 1970 initiated the National Nutritional Anaemia Prophylaxis Programme (NNAPP). The target population in this programme included pregnant women, lactating women, family planning acceptor women and children. The NSI had recommended periodic monitoring of the programme. However this was not done in the NNAPP. An evaluation of the NNAPP from 1985 to 1986 showed that the programme had not produced significant decline in prevalence of anaemia (3). The lacunae in implementation of the NNAPP were identified and remedial measures suggested. The Directorate General of Health Services and Ministry of Health and Family Welfare, Government of India has since revised the programme and it is now designated as National Anaemia Control Programme.

1.4 Scheme of action for control of anaemia

In 1977 the WHO Expert Group recommended a stepwise scheme of action for control of nutritional anaemia in population groups with high prevalence of anaemia (11). The International Nutritional Anaemia Consultative Group considered this scheme and endorsed this systematic approach for control of anaemia (10). The scheme envisages 'unsupervised' field trials before implementation of a regional or a national programme. This had not been done in previous studies (5-7). It was considered necessary to conduct such a trial with different doses of iron and a fixed dose of folic acid in pregnant women who have the highest vulnerability to anaemia.

2. OBJECTIVES

2.1 Primary objectives

2.1.1 To assess the efficacy of unsupervised administration of iron supplements (as tablets) at 60 mg, 120 mg and 180 mg dose levels with fixed dose 500 μg of folic acid when given to pregnant women at 20-24 weeks of gestation for a period of 100 days in rural areas, as measured by rise in haemoglobin concentration: and

2.1.2 To assess the frequency and nature of side effects with different doses of supplementation and their influences, if any, on the acceptability of these tablets.

2.2 Secondary objective

2.2.1 To assess the effect of unsupervised administration of iron on serum ferritin values.

PLAN OF STUDY

.1 Study Centres

The study was carried out in 6 study centres as listed below:

Study Centres	*State covered*
All India Institute of Medical Sciences (AIIMS), New Delhi	Haryana
University College of Medical Sciences (UCMS), Delhi	Delhi
nstitute of Medical Sciences (IMS), Varanasi	Uttar Pradesh
R.N.T. Medical College (RNTMC), Udaipur,	Rajasthan
Christian Medical College & Hospital (CMC), Vellore	Tamil Nadu
National Institute of Nutrition (NIN), Hyderabad	Andhra Pradesh

(The abbreviations used in the report).

3.2 Treatment Groups

The treatment groups consisted of 60 mg iron and 500 μg of folic acid (G_1), 120 mg of iron and 500 μg of folic acid (G_2) and 180 mg of iron and 500 μg of folic acid (G_3) given daily without supervision for a period of 100 days from 20-24 weeks of gestation.

3.3 Sample Size

Haemoglobin level was considered as the parameter to estimate the response to the supplements in the three groups. The sample size was, therefore, determined on the basis of variability of haemoglobin concentration, and the minimum change it is desired to detect at a given level of probability (80 percent power) and at a given level of significance ($\alpha = 0.05$) (13).

Assuming the variability in terms of standard deviation at 1g/dl haemoglobin and an expected minimum change in haemoglobin values between treatment as 1 g/dl at 5 percent level of significance and 80 percent power, a sample size of 62 is required in a two tailed test.

Allowing a provision of drop out of 20 percent and to permit post stratified analysis of the initial level of haemoglobin factors, it was proposed to enroll 100 women in each supplement group in each centre.

3.4 Subcentres

In each centre, 3 subcentres, each covering a population of approximately 5,000 were selected from one randomly selected primary health centre (PHC). The three treatment groups were allocated to the three selected subcentres at random, i.e. all enrolled pregnant women in a subcentre received the same dose of the supplement. The subcentres were chosen from the same PHC. The aim was to ensure that the groups were homogeneous in respect of socio-economic conditions of population, dietary habits, parasitic infections and other variables that influence haemoglobin values. From each subcentre 100 pregnant women at 20-24 weeks of gestation and haemoglobin level of 7 g/dl or above were enrolled over a period of one year. Those with tuberculosis, bleeding disorders, piles and other chronic and acute illnesses were excluded.

3.5 Distribution of supplements

Blood samples were collected after enrollment for the study and 30 tablets were provided to ea subject. Later supplements were delivered at 30 days intervals according to the actual requiremer (adjusting for non-compliance and loss). Monitoring of compliance was done at 15 days interva alternatively by project staff and multipurpose worker (MPW female) till the completion supplementation. A simple card was maintained to record compliance and history of illnesses a spontaneous complaints, if any, at each visit in addition to recording relevant demographic a obstetric data. Care was taken to ensure that no other medicinal iron was consumed by any subje The actual administration of tablets was, however, not supervised.

3.6 Laboratory investigations

Haemoglobin and haematocrit were determined on all blood samples collected from enrolle pregnant women before and after supplementation in all the 6 centres. It was proposed that bloo samples from 25% of enrolled women would be sent to University College of Medical Sciences fro each centre for serum ferritin analysis. Other investigations like estimation of red blood cell coun mean corpuscular haemoglobin concentration, serum vitamin B_{12}, serum folate and protoporphyrin hae ratio were optional and were to be carried out by the centre itself.

3.7 Organization

Principal investigators of the study had been chosen on the basis of their expertise in this fiel and availability of laboratory facilities in their respective institutions.

Intensive laboratory training was imparted to technicians at the University College of Medica Sciences, Delhi before initiating the study. Besides, this centre provided technical guidance whenev needed in order to ensure quality control. The ICMR secretariat coordinated the study

3.8 Reference Years

The findings of the study relate to the years 1987-89.

4. RESULTS

4.1 Comparability of treatment groups

The 3 subcentres were selected from the same PHC, in a study centre. The pre-supplementation (initial) mean haemoglobin levels between subcentres in a centre mostly did not vary significantly (Table 01).

Table 01. Mean haemoglobin value (g/dl) of all enrolled subjects before supplementation

Study Centre	M E A N ± S D			
	Subcentre (G_1)	Subcentre (G_2)	Subcentre (G_3)	Subcentre (G_1+G_2+G_3)
AIIMS NEW DELHI	9.19 ± 0.92 (46)	9.53 ± 0.70 (45)	9.39 ± 0.75 (67)	9.3 ± 0.81 (158)
UCMS DELHI	10.59 ± 1.41 (146)	10.70 ± 1.30 (168)	10.79 ± 1.32 (164)	10.70 ± 1.35 (478)
RNTMC UDAIPUR	8.90 ± 1.09 (108)	9.14 ± 0.89 (96)	8.79 ± 0.87 (98)	8.94 ± 0.97 (302)
CMC VELLORE	10.91 ± 1.27 (97)	11.09 ± 1.46 (119)	10.92 ± 1.64 (122)	10.98 ± 1.48 (338)
IMS VARANASI	10.20 ± 1.36 (97)	10.62 ± 1.28 (100)	10.45 ± 1.25 (100)	10.43 ± 1.30 (297)
NIN HYDERABAD	11.63 ± 1.36 (127)	11.31 ± 1.49 (167)	11.17 ± 1.41 (101)	11.38 ± 1.44 (395)
ALL CENTRES	10.32 ± 1.59 (621)	10.61 ± 1.49 (695)	10.38 ± 1.53 (652)	10.46 ± 1.54 (1968)

Figure in parentheses indicates number of subjects.

However, between centres mean haemoglobin values varied significantly and there were significant differences in the prevalence of anaemia amongst these centres.

Table 02. Prevalence of anaemia in study area

Centres	Mean Hb ± SD	Total subjects (no.)	Subjects with Hb<11 (g/dl)		Subjects with Hb <9 g/dl	
			No.	%	No.	%
AIIMS, NEW DELHI	9.37 ± 0.81	158	150	94.9	41	25.9
UCMS, DELHI	10.70 ± 1.35	478	278	58.1	55	11.5
RNTMC, UDAIPUR	8.94 ± 0.97	302	297	98.3	147	48.7
CMC, VELLORE	10.98 ± 1.48	338	180	53.3	26	7.7
IMS, VARANASI	10.43 ± 1.30	297	187	63.0	43	14.5
NIN, HYDERABAD	11.38 ± 1.45	395	131	33.2	23	5.8
ALL CENTRES	10.46 ± 1.54	1968	1223	62.1	335	17.0

Detailed break up at 1 g/dl interval is shown at Table 02.1.

Further, to increase precision in the comparision of haemoglobin concentrations after therapy in the different groups by removing the effects of differences in the initial haemoglobin concentrations and to compare the regressions in each of the groups to see if the slopes of the regression lines differ or not, the analysis of covariance was carried out on data from each centre as well as on pooled data (11).

The AIIMS and UCMS centres, both selected study areas from nearby states within a distance of 50 km. But even then there was significant difference in mean haemoglobin level ($p<0.001$) and prevalence of anaemia ($Z = 8.56$, $p<0.001$) in these two centres. In RNTMC Udaipur centre, the mean haemoglobin level was much below 11 g/dl whereas in CMC Vellore and NIN Hyderabad centres, the mean levels were around 11 g/dl. According to WHO criterion, haemoglobin concentration < 11 g/dl in pregnant women is considered as anaemia.

4.2 Evaluation of enrollment

The study design envisaged enrollment of 300 pregnant women (100 in each subcentre) within gestation period of 20-24 weeks in 3 selected subcentres as study subjects to be followed-up for 100 days. Enrollment was followed by drawal of venous blood sample from each woman before supplementation was initiated. During this period, it was stipulated to provide 100 tablets to each subject and contact fortnightly for monitoring of compliance. The enrollment target was not achieved in any of the study centres. A relaxation was allowed for gestation period for admission into the trial to enable them to complete the target.

In none of the centres 100 women completed the stipulated supplementation of 100 tablets (Table 03). Mean rise in haemoglobin at different doses of consumption of supplement was, therefore, evaluated to assess the effect of supplementation. The results showed that there was a significant difference in the rise of haemoglobin at consumption level of 60-79, 80-89 and 90 or more doses. (Table 04.1, 04.2 and 04.3). Highest rise was in the group which consumed more than 90 tablets. Hence the

Table 02.1 Frequency distribution of subjects at enrollment in different haemoglobin groups

Study Centre		No. of women with initial haemoglobin level (g/dl)								
		7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-12.9	13.0-13.9	≥14.0	Total
AIIMS	G_1	1	18	15	9	3	—	—	—	46
NEW	%	2.2	39.1	32.6	19.6	6.5	—	—	—	100.0
DELHI	G_2	—	7	22	14	2	—	—	—	45
	%		15.6	48.9	31.1	4.4				100.0
	G_3	—	15	33	16	3	—	—	—	67
	%		22.4	49.25	23.88	4.5				100.0
UCMS	G_1	6	16	23	39	38	19	5	—	146
DELHI	%	4.1	11.0	15.8	26.7	26.0	13.0	3.4		100.0
	G_2	1	17	27	58	38	21	3	3	168
	%	0.6	10.1	16.1	34.5	22.6	12.5	1.8	1.8	100.0
	G_3	5	10	19	57	46	21	4	2	164
	%	3.1	6.1	11.6	34.8	28.6	12.8	2.4	1.2	100.0
RNTMC	G_1	26	29	27	23	2	1	—	—	108
UDAIPUR	%	24.1	26.8	25.0	21.3	1.1	0.93			100.0
	G_2	9	27	35	23	2	—	—	—	96
	%	9.4	28.1	36.5	24.0	2.1				100.0
	G_3	16	40	25	17	—	—	—	—	98
	%	16.3	40.8	25.5	17.4					100.0
CMC	G_1	2	2	21	28	19	22	3	—	97
VELLORE	%	2.1	2.1	21.7	28.9	19.6	22.7	4.0		100.0
	G_2	6	5	26	24	22	27	5	4	119
	%	5.0	4.2	21.9	20.2	18.5	22.7	4.2	3.34	100.0
	G_3	—	11	18	37	22	20	12	2	122
	%		9.0	14.8	30.3	18.0	16.4	9.8	1.6	100.0
IMS	G_1	4	17	16	28	22	7	3	—	97
VARANASI	%	4.21	17.6	16.5	28.9	22.7	7.2	4.0		100.0
	G_2	7	—	16	34	30	10	3	—	100
	%	7.00		16.0	34.0	30.0	10.0	3.0		100.0
	G_3	6	9	8	42	25	9	1	—	100
	%	6.0	9.0	8.0	42.0	25.0	9.0	1.0		100.0
NIN	G_1	—	3	13	19	39	30	18	5	127
HYDERABAD	%		2.4	10.2	15.0	30.7	23.6	14.2	4.0	100.0
	G_2	6	7	14	29	61	31	13	6	167
	%	3.6	7.8	16.2	33.5	36.5	18.6	7.8	3.6	100.0
	G_3	3	4	8	25	35	16	6	4	101
	%	3.0	4.0	7.9	24.8	34.7	15.8	6.0	4.0	100.0
ALL	G_1	39	85	115	146	123	79	29	5	621
CENTRES	%	6.3	13.7	18.5	23.5	19.8	12.8	4.7	0.8	100.0
	G_2	29	63	140	182	155	89	24	13	695
	%	4.0	9.1	20.1	26.2	22.3	12.8	3.5	1.9	100.0
	G_3	30	89	111	194	131	66	23	8	652
	%	4.6	13.6	17.0	29.8	20.1	10.1	3.5	1.2	100.0
	$G_1+G_2+G_3$	98	237	366	522	409	234	76	26	1968
	%	5.0	12.0	18.6	26.5	21.0	11.9	3.9	1.3	100.0

Table 03. Total number of subjects enrolled, dropped out and frequency distribution of subjects by different doses of supplements

Centre	Supplement Group	Total enrolled no.	No. of women consuming tablets				Total	Dropouts (No.)
			1-59	60-79	80-89	≥ 90		
AIIMS NEW DELHI	G_1	46	—	—	—	31	31	15
	%					67.39	67.39	32.61
	G_2	45	—	—	—	30	30	15
	%					66.67	66.67	33.33
	G_3	67	—	—	—	37	37	30
	%					55.22	55.22	44.78
UCMS DELHI	G_1	146	26	36	19	27	108	38
	%		17.80	24.66	13.01	18.49	73.97	26.03
	G_2	168	17	35	22	36	110	58
	%		10.12	20.83	13.10	21.43	65.48	34.52
	G_3	164	21	34	30	32	117	47
	%		12.80	20.73	18.29	19.51	71.34	28.66
RNTMC UDAIPUR	G_1	108	—	—	37	71	108	—
	%				34.25	65.74	100.00	—
	G_2	96	—	—	26	70	96	—
	%				27.08	72.92	100.00	—
	G_3	98	—	—	26	72	98	—
	%				26.80	73.20	100.00	—
CMC VELLORE	G_1	97	1	3	12	56	72	25
	%		1.03	3.09	12.38	57.73	74.23	25.77
	G_2	119	5	3	18	58	84	35
	%		4.20	2.52	15.13	48.73	70.59	29.41
	G_3	122	—	9	17	72	98	24
	%			7.38	13.93	59.02	80.33	19.67
IMS VARANASI	G_1	97	—	1	—	96	97	—
	%			1.03		98.97	100.0	—
	G_2	100	—	1	—	99	100	—
	%			1.00		99.00	100.00	—
	G_3	100	—	—	2	97	99	1
	%				2.00	97.00	99.0	(1.0)
NIN HYDERABAD	G_1	127	9	11	18	41	79	48
	%		7.09	8.67	14.17	32.28	62.20	37.80
	G_2	167	9	12	8	62	91	76
	%		5.39	7.19	4.79	37.13	54.49	45.51
	G_3	101	2	3	4	53	62	39
	%		1.98	2.97	3.96	52.48	61.39	38.61
ALL CENTRES	G_1	621	36	51	86	322	495	126
	%		5.80	8.21	13.85	51.85	79.71	20.29
	G_2	695	31	51	74	355	511	184
	%		4.46	7.34	10.65	51.08	73.53	26.48
	G_3	652	23	46	79	363	511	141
	%		3.52	7.06	12.11	55.67	78.37	21.63
	$G_1+G_2+G_3$	1968	90	148	239	1040	1517	451
	%		4.57	7.52	12.14	52.85	77.08	22.92

Table 04.1 Dose response of the 3 supplement groups at 60-79 tablets consumption levels

Centre		n	Mean±SD Initial	Mean±SD Final	Mean of difference of Initial & Final	Paired 't'
		60 — 79 TABLETS				
AIIMS	G_1	—	—	—	—	—
NEW DELHI	G_2	—	—	—	—	—
	G_3	—	—	—	—	—
UCMS	G_1	36	10.60±1.28	10.73±1.70	0.12	0.45
DELHI	G_2	35	10.75±1.14	11.46±1.40	0.71	3.26 **
	G_3	34	10.91±1.19	11.09±1.58	0.18	0.74
RNTMC	G_1	—	—	—	—	—
UDAIPUR	G_2	—	—	—	—	—
	G_3	—	—	—	—	—
CMC	G_1	3	10.56±1.43	10.72±1.18	0.16	0.19
VELLORE	G_2	3	10.70±1.85	11.11±1.63	0.41	0.33
	G_3	9	10.85±1.58	10.42±1.35	-0.43	0.62
IMS	G_1	1	10.64±0	11.13±0	0.49	—
VARANASI	G_2	1	10.56±0	11.65±1.09	—	
	G_3	—	—	—	—	—
NIN	G_1	11	12.16±0.83	13.32±1.46	1.16	0.97
HYDERABAD	G_2	12	11.42±1.68	11.57±1.45	0.15	0.23
	G_3	3	10.92±0.51	11.48±0.97	0.56	0.88
ALL	G_1	51	10.95±1.37	11.30±1.97	0.35	1.04
CENTRES	G_2	51	10.90±1.40	11.47±1.48	0.60	2.11
	G_3	46	10.90±1.29	10.98±1.56	0.08	0.27

**P<0.01

Table 04.2 Dose response of the 3 supplement groups at 80-89 tablet consumption levels

Centre		n	Mean±SD Initial	Mean±SD Final	Mean of difference of Initial & Final	Paired 't'
		80 — 89 TABLETS				
AIIMS	G_1	—	—	—	—	—
NEW DELHI	G_2	—	—	—	—	—
	G_3	—	—	—	—	—
UCMS	G_1	19	10.69±1.55	11.07±1.64	0.38	9.73***
DELHI	G_2	22	10.50±1.45	11.08±1.76	0.58	1.33
	G_3	30	10.78±1.63	11.41±1.63	0.63	1.88
RNTMC	G_1	37	8.54±0.87	9.38±0.95	0.83	6.09***
UDAIPUR	G_2	26	8.92±0.72	10.23±1.09	1.31	5.78***
	G_3	26	8.61±0.92	10.55±1.16	1.94	10.34***
CMC	G_1	12	11.18±1.28	11.20±1.40	0.02	0.01
VELLORE	G_2	18	10.96±1.60	11.23±1.97	0.27	0.59
	G_3	17	10.55±1.71	10.43±1.79	-0.12	-0.03
IMS	G_1	—	—	—	—	—
VARANASI	G_2	—	—	—	—	—
	G_3	2	10.13±0.15	10.99±0.25	0.86	—
NIN	G_1	18	11.90±1.27	12.71±1.67	0.81	2.01*
HYDERABAD	G_2	8	12.18±1.65	11.86±2.06	-0.32	-0.50
	G_3	4	12.68±1.20	12.45±1.86	-0.23	-0.54
ALL	G_1	86	10.09±1.87	10.70±1.90	0.61	0.01
CENTRES	G_2	74	10.24±1.74	10.90±1.78	0.66	0.98
	G_3	79	10.10±1.84	11.13±1.67	1.03	3.04**

*P<0.05, **P<0.01, ***P<0.001

Table 04.3 Dose response of the 3 supplement groups at ≥90 tablets consumption level

Centre		≥90TABLETS n	Mean±SD Initial	Mean±SD Final	Mean of difference of Initial & Final	Paired 't'
AIIMS	G_1	31	9.25±0.25	10.04±0.72	0.78	6.47***
NEW DELHI	G_2	30	9.63±0.74	10.60±0.63	0.97	6.43***
	G_3	37	9.28±0.75	10.49±0.50	1.22	10.73***
UCMS	G_1	27	10.13±1.52	11.18±1.60	1.04	10.73.**
DELHI	G_2	36	10.92±1.33	11.64±1.33	0.72	2.66*
	G_3	32	10.57±1.03	11.74±1.41	1.17	3.80***
RNTMC	G_1	71	8.90±1.03	9.82±0.97	0.92	14.44***
UDAIPUR	G_2	70	9.20±0.94	10.60±1.05	1.40	16.91***
	G_3	72	8.85±0.85	10.76±1.12	1.91	21.54***
CMC	G_1	56	10.89±1.27	11.33±1.38	0.44	2.45*
VELLORE	G_2	58	11.03±1.58	11.65±1.49	0.62	3.55**
	G_3	72	11.26±1.38	11.43±1.40	0.16	0.95
IMS	G_1	96	10.19±1.35	11.96±1.09	1.77	17.20***
VARANASI	G_2	99	10.61±1.29	11.88±1.10	1.27	10.83***
	G_3	97	10.45±1.25	11.94±1.01	1.49	12.60***
NIN	G_1	41	11.72±1.55	12.08±1.53	0.35	1.25
HYDERABAD	G_2	62	11.33±1.35	12.09±1.31	0.76	3.28**
	G_3	53	11.10±1.15	12.03±1.28	1.23	5.04***
ALL	G_1	322	10.13±1.56	11.14±1.50	1.01	14.23***
CENTRES	G_2	355	10.48±1.47	11.50±1.33	1.02	14.56***
	G_3	363	10.27±1.44	11.50±1.32	1.22	16.43***

*$p<0.05$
**$p<0.01$
***$p<0.001$

haemoglobin values relating to subjects consuming 90 or more tablets were considered for detailed analysis.

In the following paragraphs details of enrollment in each centre and reasons for non-compliance and dropout are discussed. Henceforth consumption below 90 doses is termed as 'non-compliance' and subjects from whom final blood sample could not be drawn are termed as 'dropouts'. Further, values of any parameter/statistics relating to G_1, G_2 and G_3 are given in the above order throughout in the description and in the tables.

2.1 AIIMS, New Delhi

In this centre, total enrollment in the 3 supplemented groups was 46, 45 and 67. A large roportion of the enrolled women dropped out as they refused drawal of final blood sample. Some ere lost to follow up. A few cases delivered before completion of supplement. In all these cases, final lood sample could not be drawn (Table 05). The ultimate sample size, i.e. those who consumed 90 or nore tablets were 31, 30 and 37, the corresponding dropout rates being 32.6%, 33.3% and 44.8% in roups G_1, G_2 and G_3 respectively (Table 03).

.2.2 UCMS, Delhi

The initial enrollment was highest in this centre, being 146, 168 and 164. But the number of non-ompliants were of high order, non-compliants being 81 (55.5%), 74 (44.0%) and 85 (51.8%) and lropouts 38 (26.0%), 58 (34.5%), and 47 (28.7%). Those who completed the supplementation (90 or nore tablets) were only 27 (18.5%), 36 (21.4%) and 32 (19.5%) in the 3 treatment groups (Table 03)

Shifting to parents' houses for delivery, delivery taking place before completion of supplementation and side effects were the three main reasons for drop out. A few cases of refusal of final blood sample were also recorded. Non-compliance was mainly due to temporary absence from the house, leading to break in continuity as well as incomplete supplementation. Some subjects complained that size of the 180 mg tablet was too big (Table 05).

4.2.3 RNTMC, Udaipur

In RNT Medical College, Udaipur centre, the inital enrollment was 100, 96 and 98 in the 3 groups with no dropout in any group. However, the final sample size reduced to 71 (65.7%), 70 (72.0%) and 72 (73.2%) due to non-compliance of 90 tablets of supplement (Table 03).

4.2.4 CMC, Vellore

CMC, Vellore centre enrolled 97, 119 and 122 subjects in the 3 groups, of which 56 (57.7%), 58 (48.7%) and 72 (59.0%) only completed 90 or more doses of supplement. Dropouts and non-compliance numbered 25 (25.8%), 35 (29.4%), 24 (19.7%) and 16 (16.5)%, 26 (21.9%), 26 (21.3%) respectively in the 3 supplement groups (Table 03). The two major factors responsible for dropouts in this centre also were shifting to parents houses for delivery and delivery taking place before completion of supplementation. A few cases of withdrawal due to side effects were also recorded. Difficulty in swallowing big tablets was reported by a few subjects (Table 05).

4.2.5 IMS, Varanasi

IMS Varanasi centre, enrolled women totalling 97,100 and 100 in the 3 supplement groups respectively. All of them continued till completion of supplementation, except 1, 1 and 2 subjects, in the three groups who consumed less than 90 tablets and one dropped out (Table 03).

4.2.6 NIN, Hyderabad

In NIN, Hyderabad centre, out of total enrollment of 127, 167 and 101 women, only 41 (32.3%), 62 (37.1%) and 53 (52.8%) completed 90 tablets or more of supplements. Dropouts were 48 (37.8%), 76 (45.5%) and 40 (39.6%) and non-compliances were 38 (39.9%), 299 (17.4%) and 8 (7.9%) (Table 03). Shifting to mother's place and early delivery again overtook all the other reasons for dropout. Side effects were experienced by a few. In case of severe side effects, the subjects were shifted to lower doses and considered as dropouts from the study (Table 05).

Table 05. Reasons for dropout in the 3 supplement groups in each centre

Centre/ Supplement group	N	Reasons For Dropout: Side Effects	Delivered/Aborted Stillbirth	Shifted/Loss to Followup	Refused Final blood Sample Drawal	Prefer Private Treatment	Not Consumed/ Not Cooperative	Other Reasons	Total*
AIIMS NEW DELHI									
G1	46	—	—	5	6	—	3	1	15
%				10.9	13.0		6.5	2.2	
G2	45	1	2	17	1	—	2	—	15
%		2.2	4.4	37.8	2.2		4.4		
G3	67	2	2	14	6	—	6	—	30
%		3.0	3.0	20.9	8.9		8.9		
UCMS DELHI									
G1	146	19	17	18	7	3	3	12	38
%		13.0	11.6	12.3	4.8	2.1	2.1	8.2	
G2	168	8	26	30	6	7	3	4	58
%		4.8	15.5	17.9	3.6	4.2	1.8	2.4	
G3	164	20	21	26	9	6	6	10	47
%		12.2	12.8	15.9	5.5	3.7	3.7	6.1	
RNTMC UDAIPUR		NO DROPOUT							
CMC VELLORE									
G1	97	—	9	11	—	—	—	—	25
%			9.3	11.3					
G2	119	4	10	14	—	—	—	2	35
%		3.4	8.4	11.8				1.7	
G3	122	8	9	9	—	—	—	1	24
%		6.6	7.4	7.4				0.8	
IMS VARANASI		NOT RECORDED							
NIN HYDERABAD									
G1	127	14	16	17	—	3	7	3	48
%		11.0	12.6	13.4		2.4	5.5	2.4	
G2	167	11	24	24	4	4	6	4	76
%		6.6	14.4	14.4	2.4	2.4	3.6	2.4	
G3	101	22	16	9	1	3	—	2	40
%		21.8	15.8	8.9	1.0	3.0		2.0	

* Total not additive due to multiple response

4.3 Cumulative frequency distribution of initial and final haemoglobin values.

Cumulative frequency distribution of women with difference of 1 g/dl of initial haemoglobin level alongwith corresponding final haemoglobin level for each of the centres and pooled data as well is presented in figures 1-14. Pre and post-treatment frequencies at different haemoglobin levels showed significant differences in all the treatment groups (Table 06).

Thus prevalences of anaemia before and after supplementation indicate a significant reduction in all treatment groups in all the centres with highest reduction being in group G_3 in the pooled sample Figs. 15-21 and (Table 07).

Table 06 Frequency distribution of pregnant women by different initial haemoglobin levels (g/dl) before and after supplementation

Centre/ plement group	n	7.0 — 7.9		8.0 — 8.9		9.0 — 9.9		10.0 — 10.9		11.0 — 11.9		12.0 — 12.9		≥13.0	
		I	F	I	F	I	F	I	F	I	F	I	F	I	F
MS NEW DELHI															
G_1	31	—	—	14	2	8	8	7	16	2	5	—	—	—	—
%				45.2	6.5	25.8	25.8	22.6	22.6	51.6	6.9	16.1			
G_2	30	—	—	4	—	13	4	11	15	2	11	—	—	—	—
%				13.3	—	43.3	13.3	36.7	50.0	6.7	36.7				
G_3	37	—	—	10		17	4	9	23	1	10				
%				27.0		45.9	10.8	24.3	26.2	2.7	27.0				
MS DELHI															
G_1	27	2	—	5	1	4	5	7	6	6	6	2	5	1	4
%		7.4		16.5	3.7	14.8	18.5	26.9	22.6	22.2	22.2	17.4	18.5	3.7	14.8
G_2	36	—	1	5	1	3	3	9	4	9	13	9	9	1	5
%			2.8	13.9	2.8	8.3	8.3	23.0	11.1	25.0	36.1	25.0	25.0	2.8	13.9
G_3	32	1	—	2	3	4	1	14	2	10	12	1	9	—	5
%		3.1		6.3	9.4	12.5	3.1	43.8	6.3	31.3	37.5	3.1	28.1		15.6
NTMC UDAIPUR															
G_1	71	18	1	15	18	19	11	19	32	—	9	—	—	—	—
%		25.4	1.4	21.1	25.4	26.8	15.5	26.8	45.1		12.7				
G_2	70	7	1	17	2	24	11	20	26	2	28	—	1	—	1
%		10.0	1.4	25.4	2.9	35.3	1 5.7	28.6	37.1	2.9	40.0		1.4		1.4
G_3	72	9	—	31	4	18	10	14	29	—	21	—	5	—	3
%		12.5		43.1	5.6	25.0	13.9	19.4	40.3		29.2		6.9		
MC VELLORE															
G_1	56	2	1	1	1	9	8	18	17	13	11	12	11	1	7
%		3.6	1.8	1.8	1.8	16.1	14.3	32.1	30.4	23.2	19.6	21.4	19.6	1.8	12.5
G_2	58	2	1	2	—	11	8	13	13	14	10	11	17	5	9
%		3.4	1.7	3.4		19.0	13.8	22.4	22.4	24.1	17.2	19.0	29.3	8.6	15.5
G_3	72	—	—	5	2	7	12	22	15	14	15	17	18	7	10
%				6.9	2.8	9.7	16.7	30.6	28.8	19.4	20.8	23.6	25.0	9.7	13.9
MS VARANASI															
G_1	96	4	—	17	—	16	1	27	16	23	31	6	32	3	16
%		4.2		17.7		16.7	1.0	28.1	16.7	24.0	32.3	6.2	33.3	2.1	16.2
G_2	99	7	—	—	—	16	2	34	14	29	40	10	24	3	19
%		7.1				16.2	2.0	34.3	14.1	29.3	40.4	10.1	24.2	3.0	19.2
G_3	97	6	—	8	1	8	1	41	12	24	39	9	26	1	18
%		6.2		8.2	1.0	8.2	1.0	42.3	12.4	24.7	40.2	9.3	26.8	1.0	18.6
IN HYDERABAD															
G_1	41	—	—	1	3	7	1	4	6	10	7	7	11	12	13
%				2.4	7.3	17.1	2.4	9.8	14.5	24.4	17.1	17.1	26.8	29.3	31.7
G_2	62	2	—	3	—	4	4	10	8	21	16	17	18	5	16
%		3.2		4.8		6.5	6.5	16.1	12.9	33.9	25.8	27.4	29.0	8.1	25.8
G_3	53	2	—	1	1	2	1	16	4	20	16	10	15	2	16
%		3.8		1.9	1.9	3.8	1.9	30.2	7.5	37.7	30.2	18.9	28.3	3.8	30.2
ALL CENTRES															
G_1	322	26	2	53	25	63	34	82	93	54	69	27	59	17	40
%		8.1	0.6	16.5	7.8	19.6	10.6	25.5	28.9	16.8	21.4	8.4	18.3	5.3	12.4
G_2	355	18	3	31	3	71	32	97	80	77	118	47	69	14	50
%		5.1	0.8	8.7	0.8	22.0	9.0	24.3	22.5	21.7	33.2	13.2	21.4	3.9	21.4
G_3	363	18	—	57	11	56	29	116	85	69	113	37	73	10	52
%		5.0		15.7	3.0	15.4	8.0	32.0	23.4	19.0	31.1	10.2	20.1	2.8	14.3

PERCENTAGE OF CUMULATIVE FREQUENCY OF PREGNANT WOMEN AT DIFFERENT HAEMOGLOBIN LEVELS BEFORE AND AFTER SUPPLEMENTATION IN THE 3 SUPPLEMENT GROUPS.

Fig-1

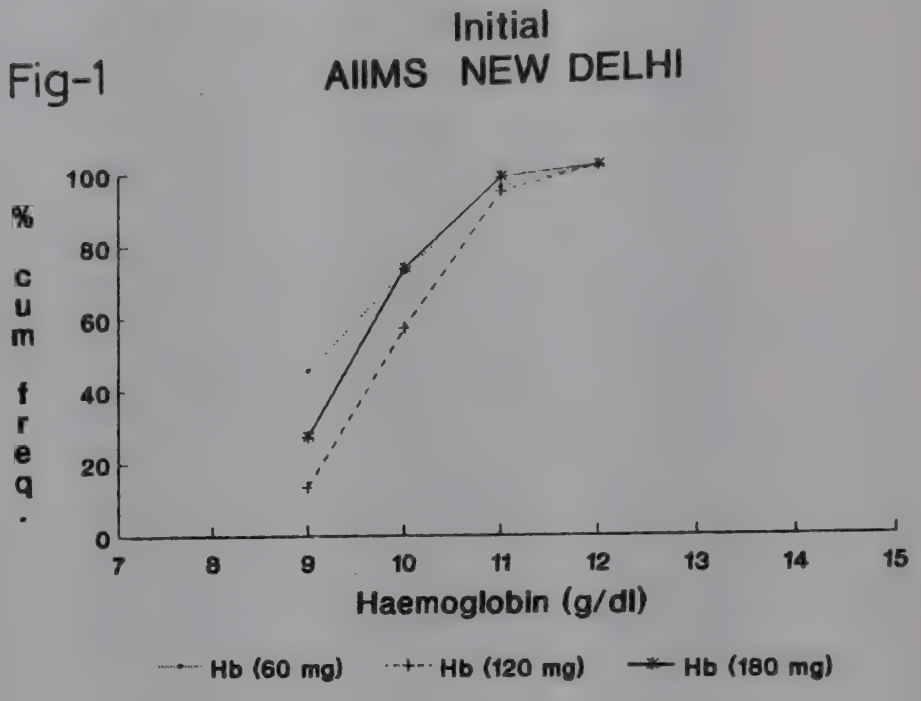


Fig-2

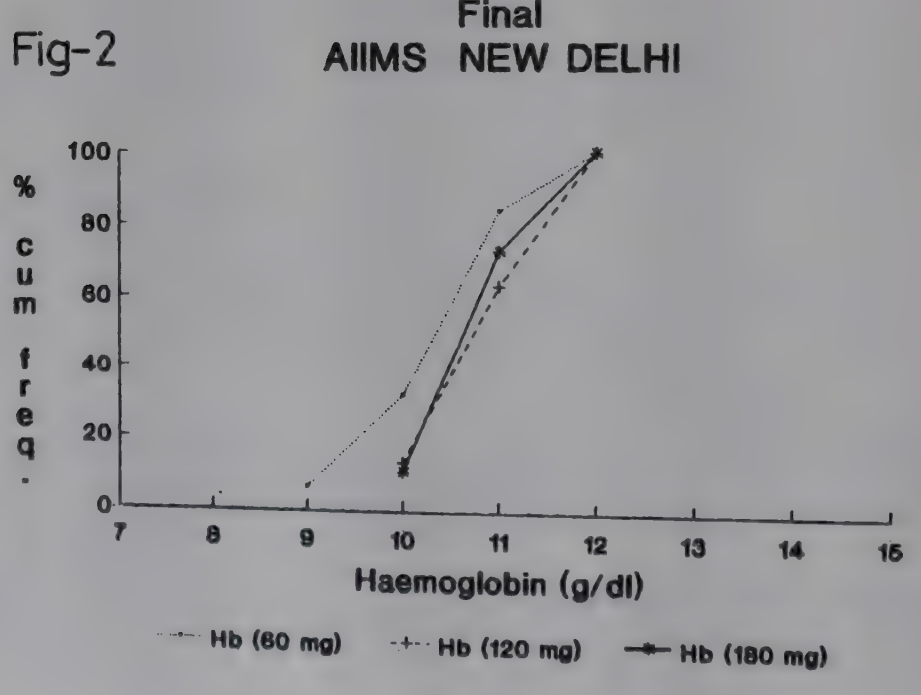


Fig-3

Initial
UCMS NEW DELHI

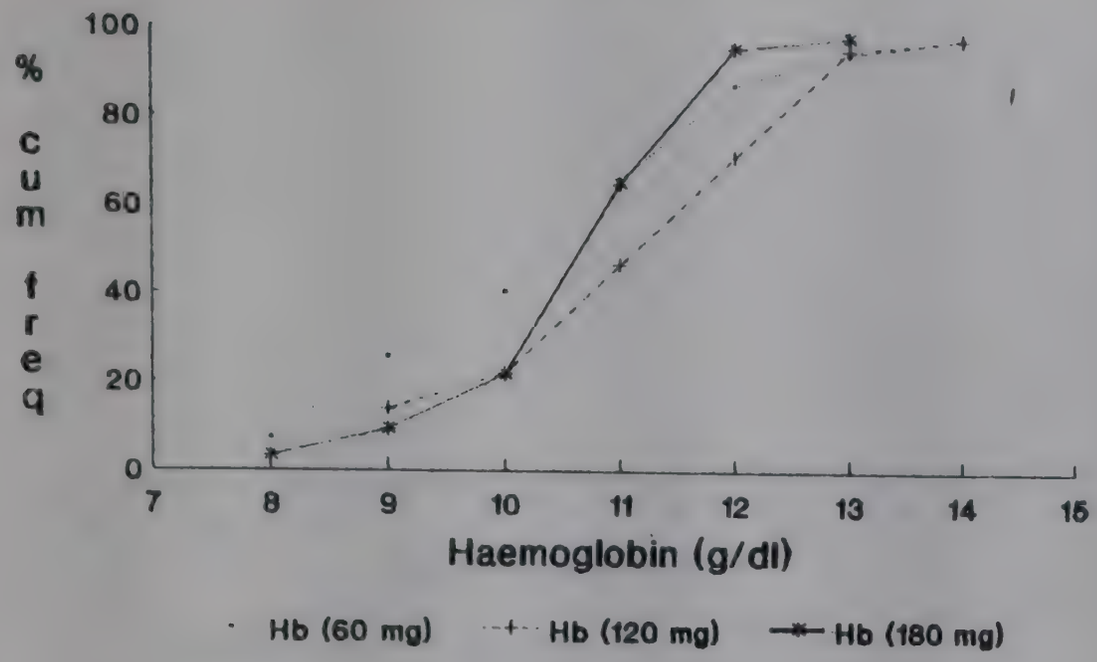


Fig-4

Final
UCMS NEW DELHI

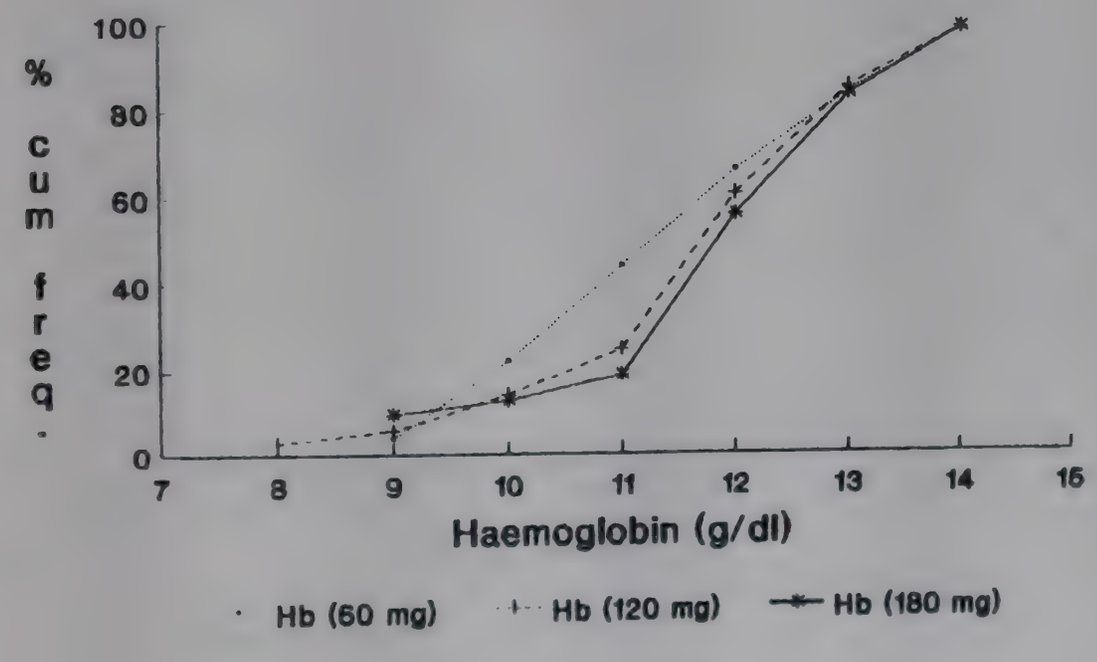


Fig-5

Initial
RNTMC UDAIPUR

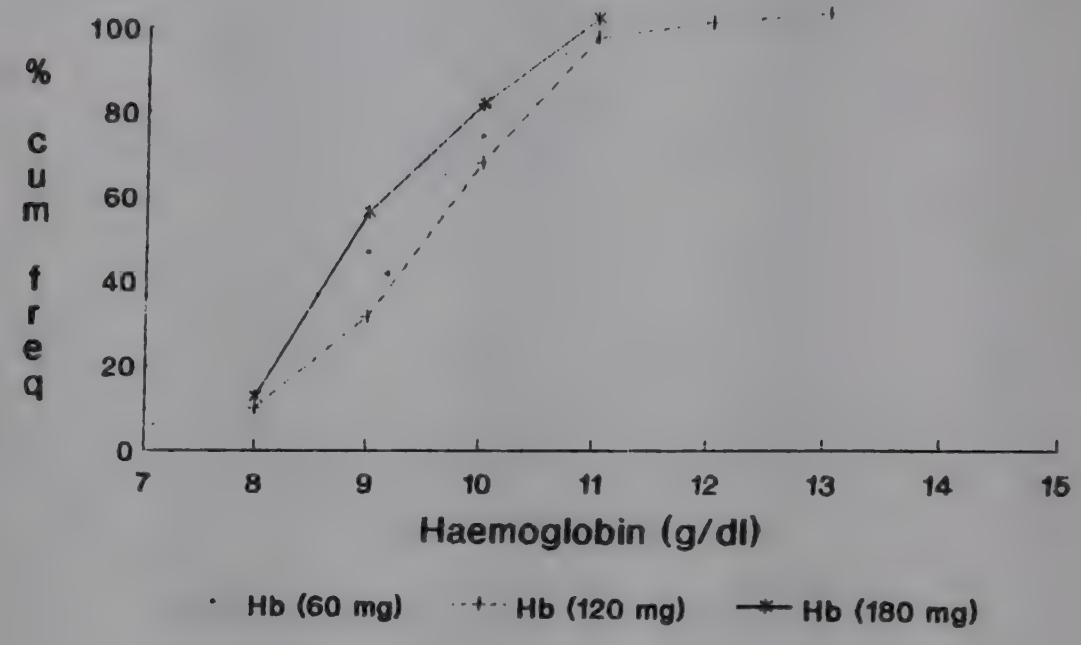


Fig-6

Final
RNTMC UDAIPUR

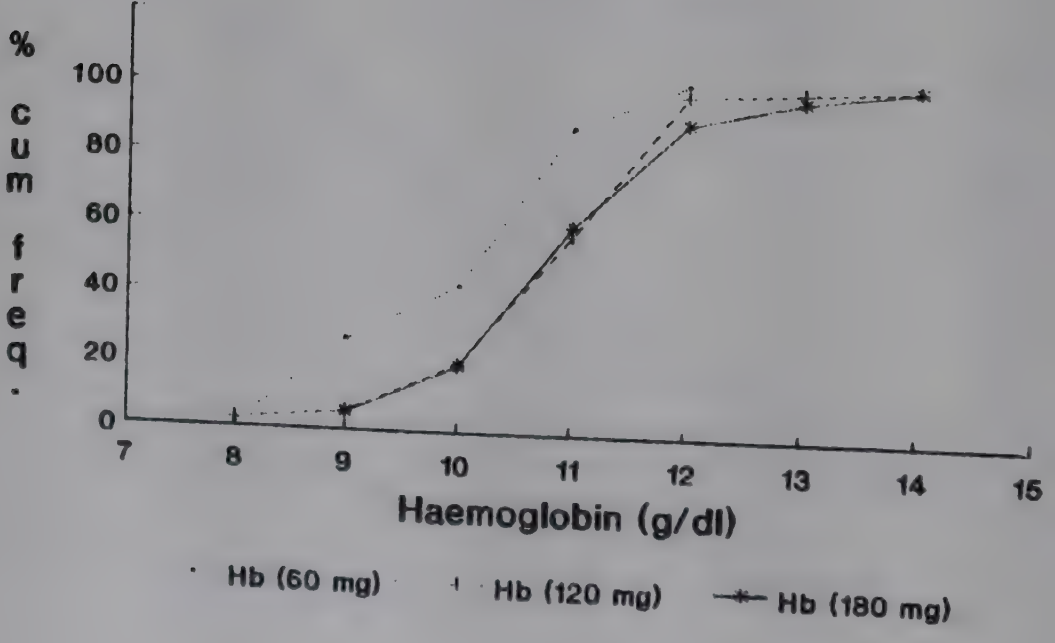


Fig-7

Initial
CMC VELLORE

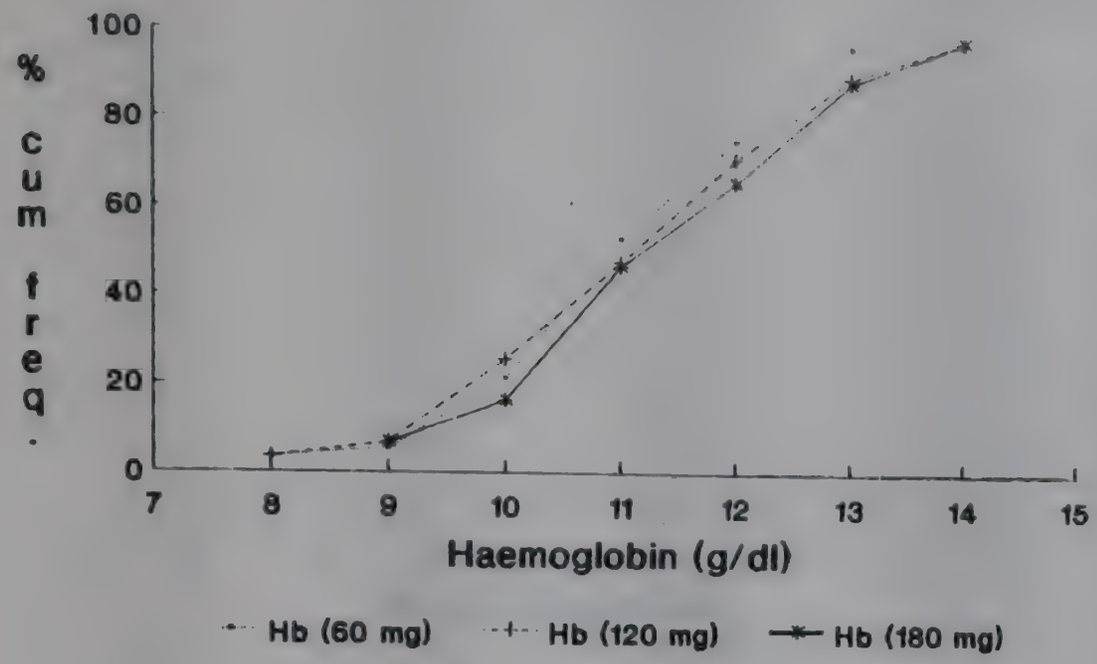


Fig-8

Final
CMC VELLORE

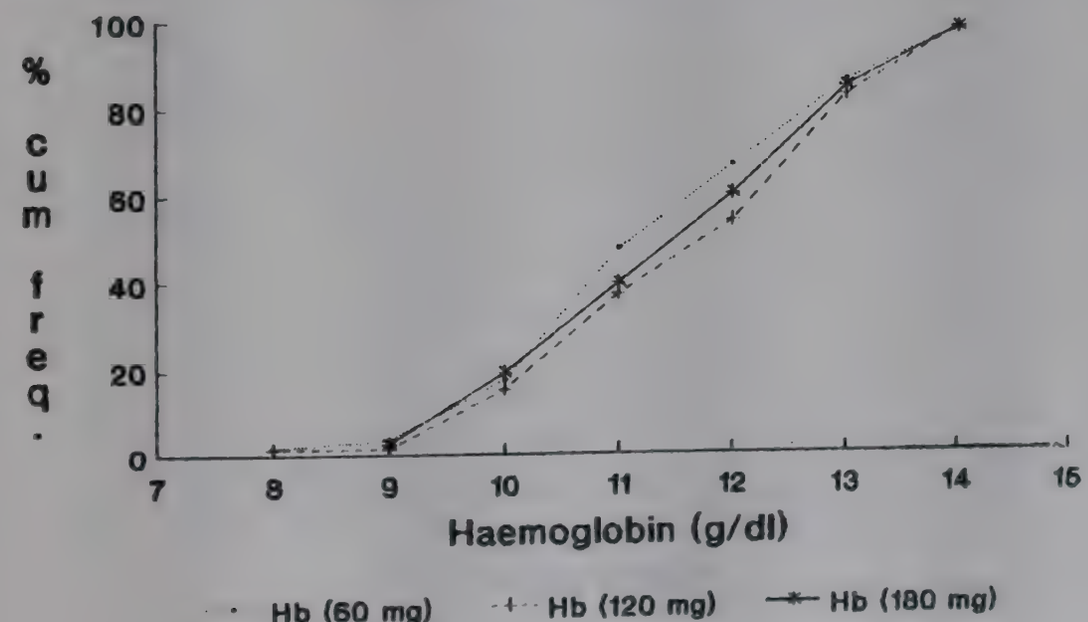


Fig-9

Initial
IMS,BHU VARANASI

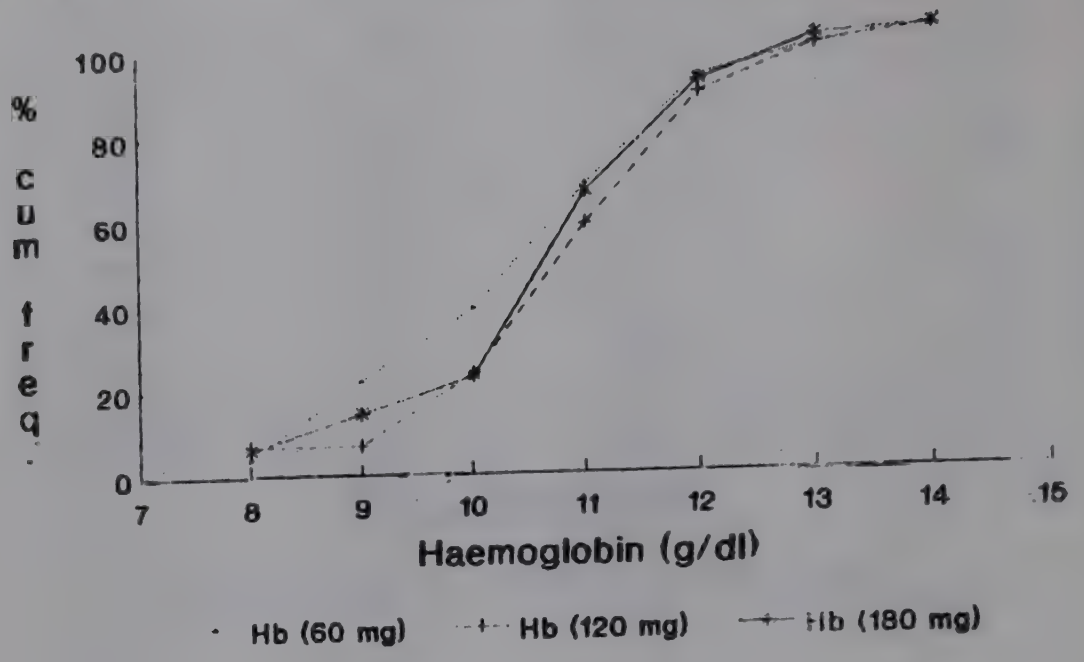
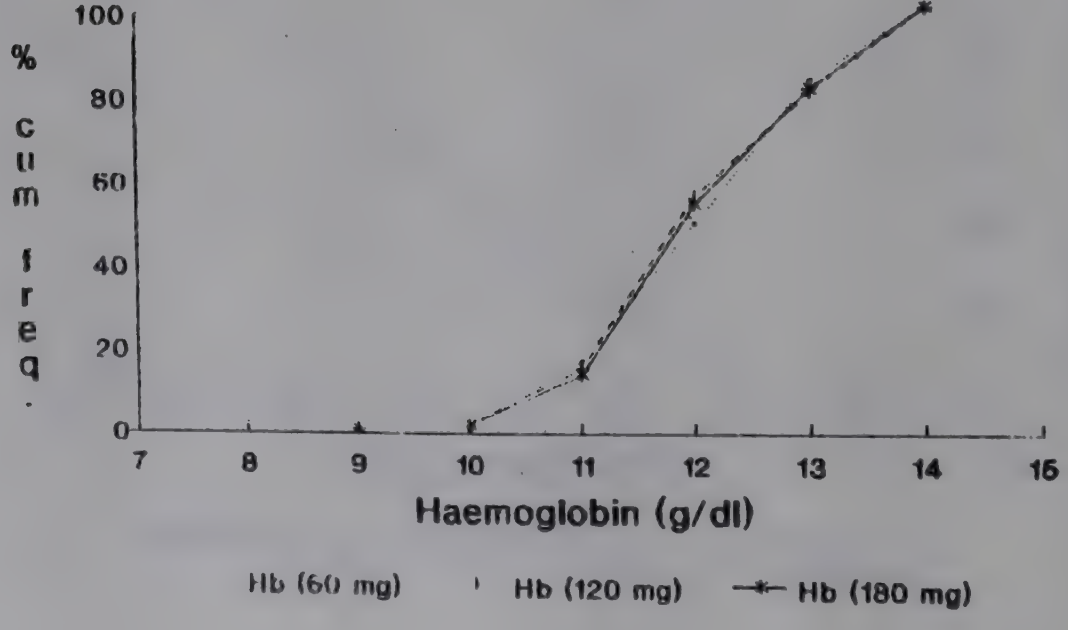


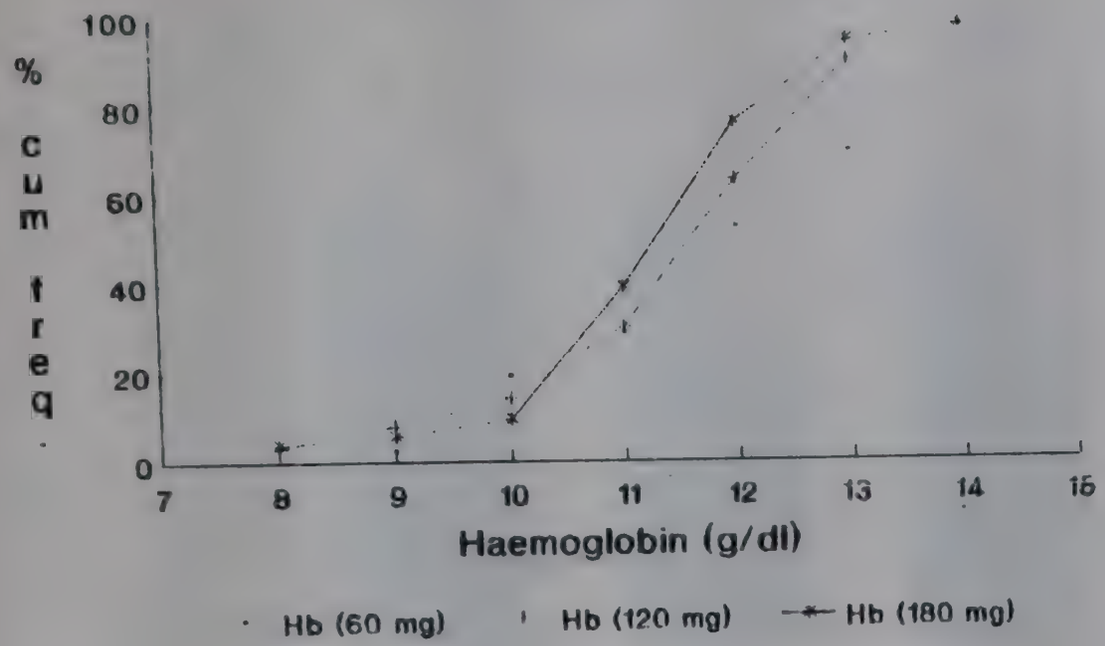
Fig-10

Final
IMS,BHU VARANASI



Initial

Fig-11 NIN HYDERABAD



Final

Fig-12 NIN HYDERABAD

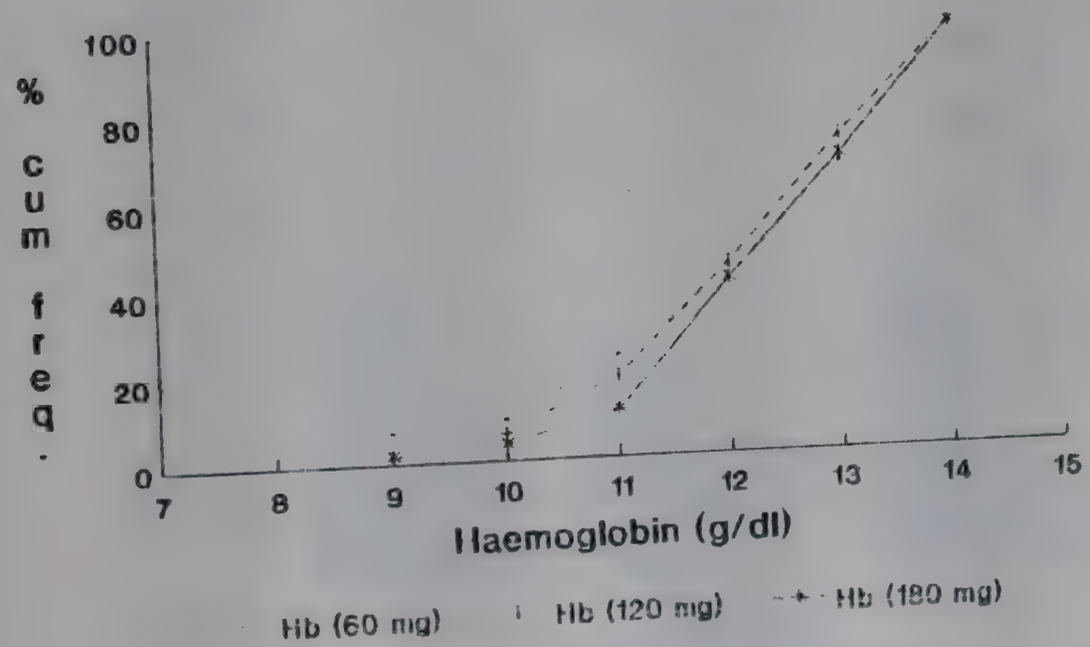


Fig-13

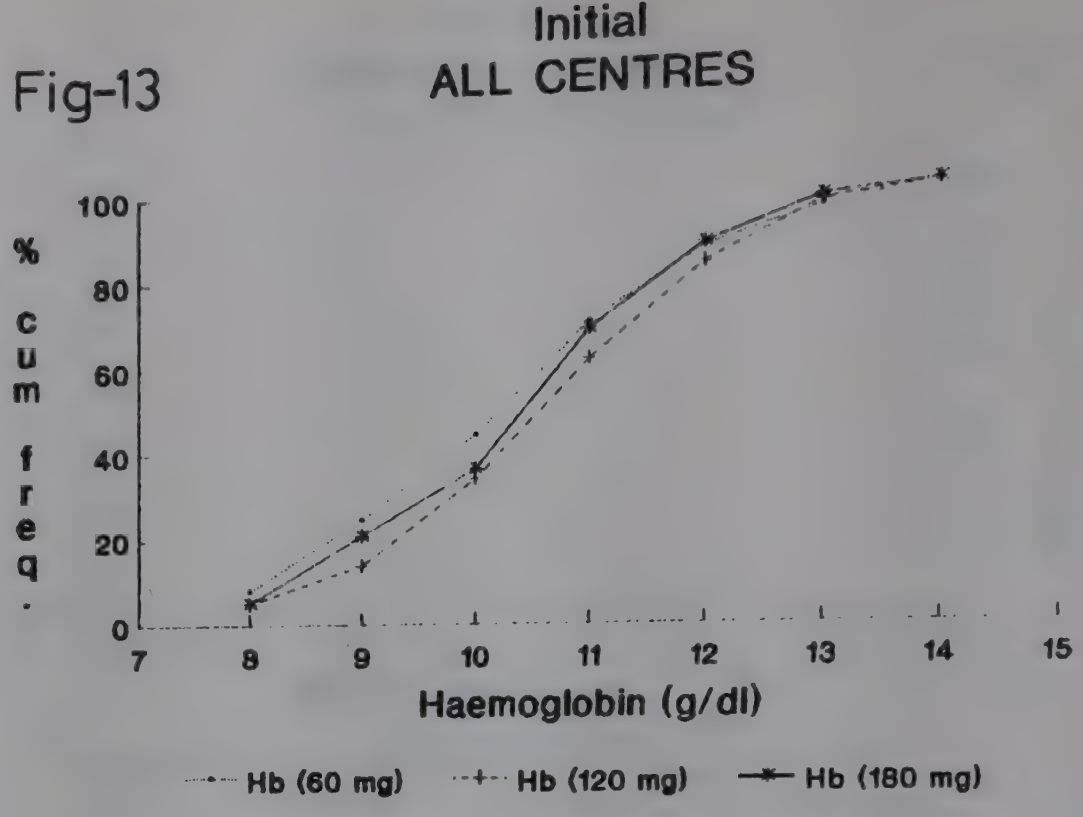
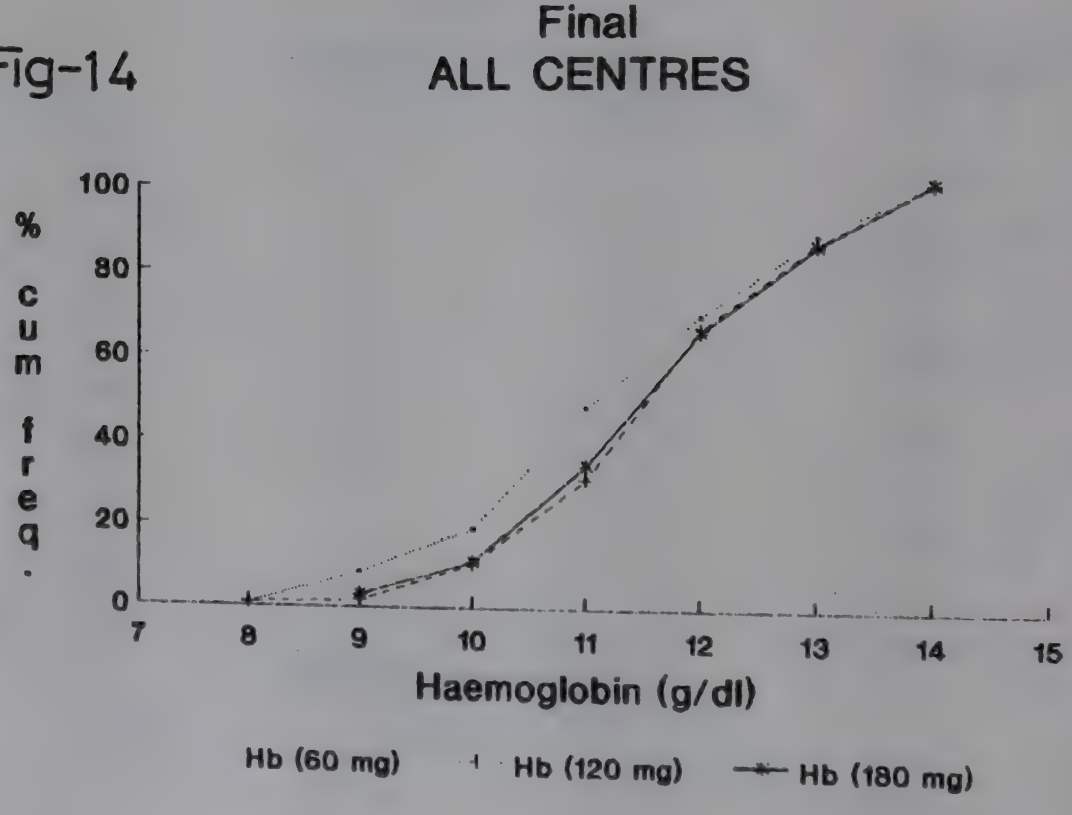

Initial
ALL CENTRES
% cum freq.
100
80
60
40
20
0
7
8
9
10
11
12
13
14
15
Haemoglobin (g/dl)
Hb (60 mg)
Hb (120 mg)
Hb (180 mg)

Fig-14


Final
ALL CENTRES
% cum freq.
100
80
60
40
20
0
7
8
9
10
11
12
13
14
15
Haemoglobin (g/dl)
Hb (60 mg)
Hb (120 mg)
Hb (180 mg)

PERCENTAGE OF ANAEMIC PREGNANT WOMEN BEFORE AND AFTER SUPPLEMENTATION IN THE 3 SUPPLEMENT GROUPS.

Fig-15 **AIIMS - NEW DELHI**

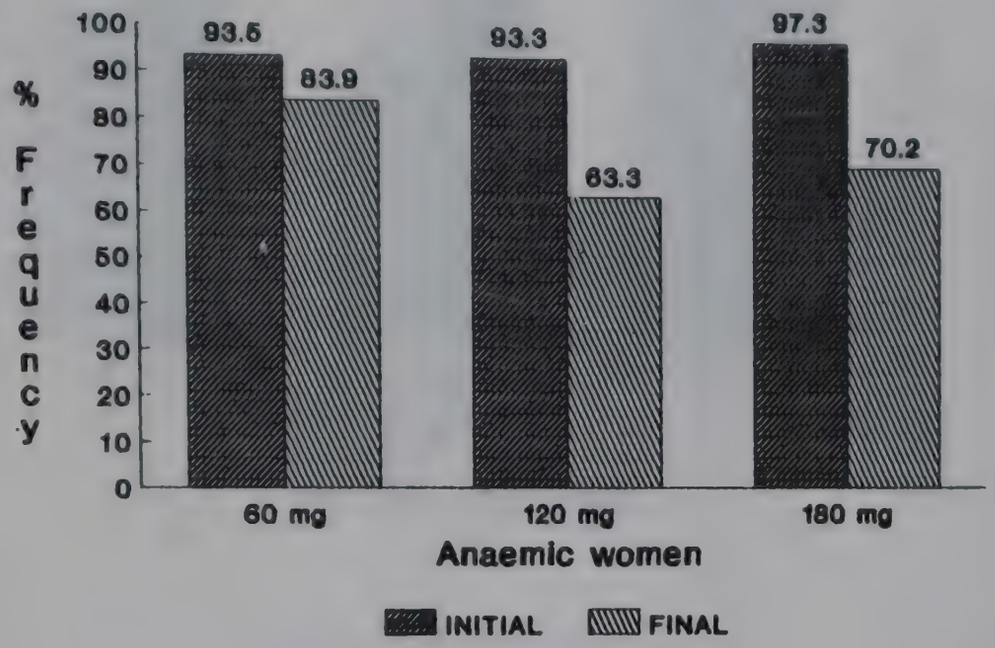
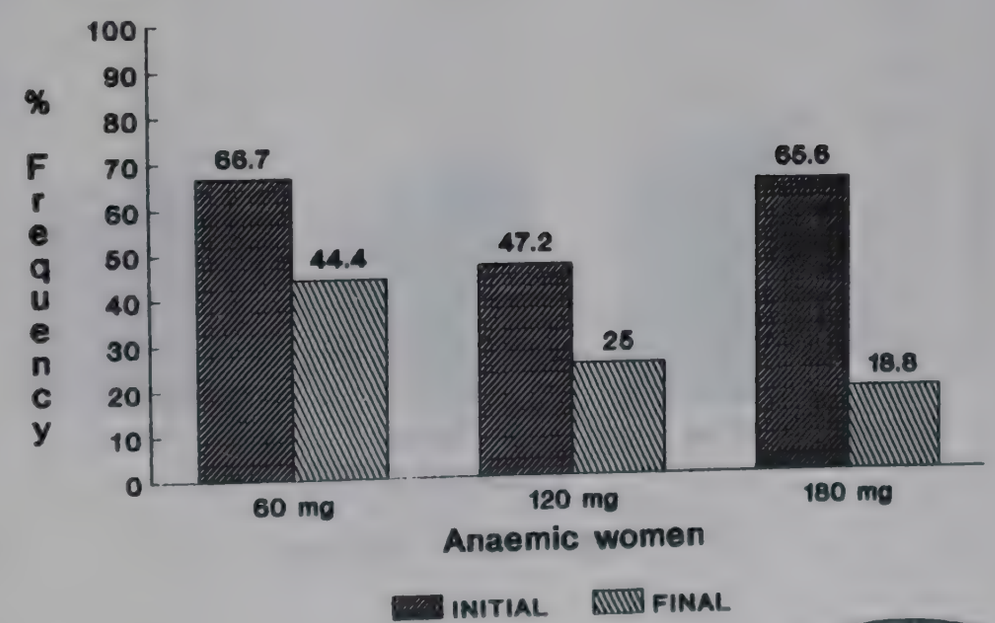


Fig-16 **UCMS DELHI**



WH-105
1990
COMMUNITY HEALTH
LIBRARY
AND
INFORMATION
CENTRE
BANGALORE

Fig-17

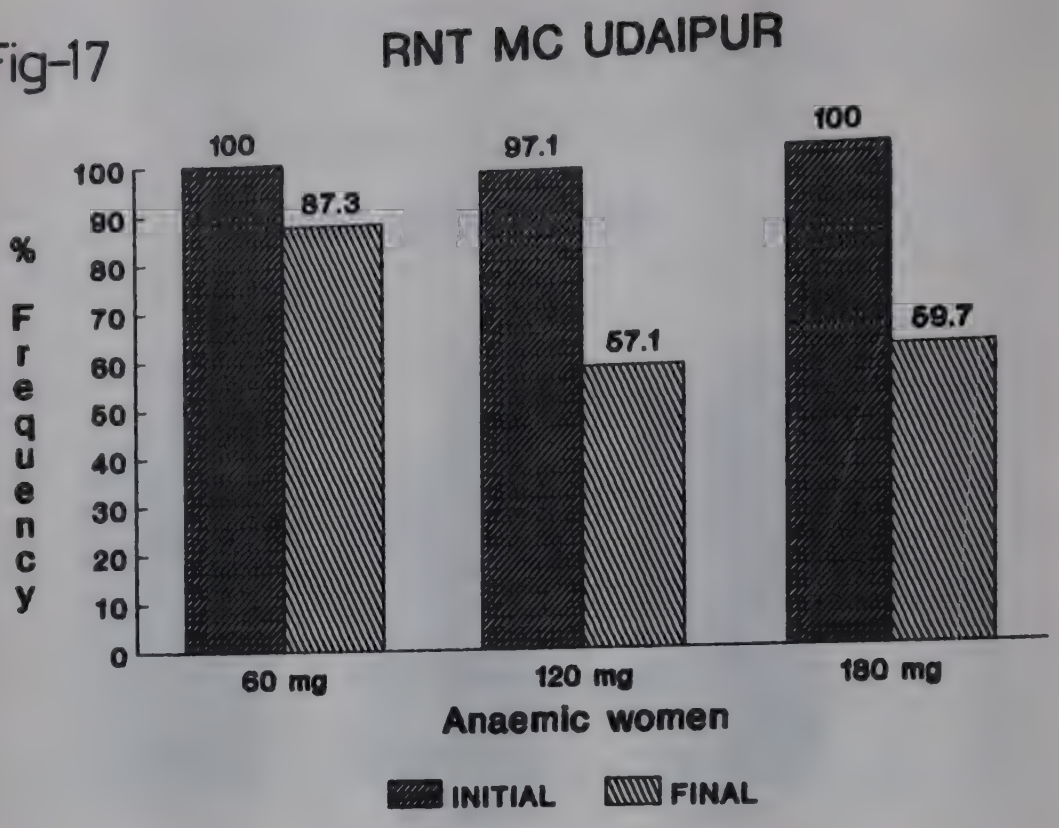

RNT MC UDAIPUR
100
87.3
97.1
57.1
100
59.7
% Frequency
100
90
80
70
60
50
40
30
20
10
0
60 mg
120 mg
180 mg
Anaemic women
INITIAL
FINAL

Fig-18

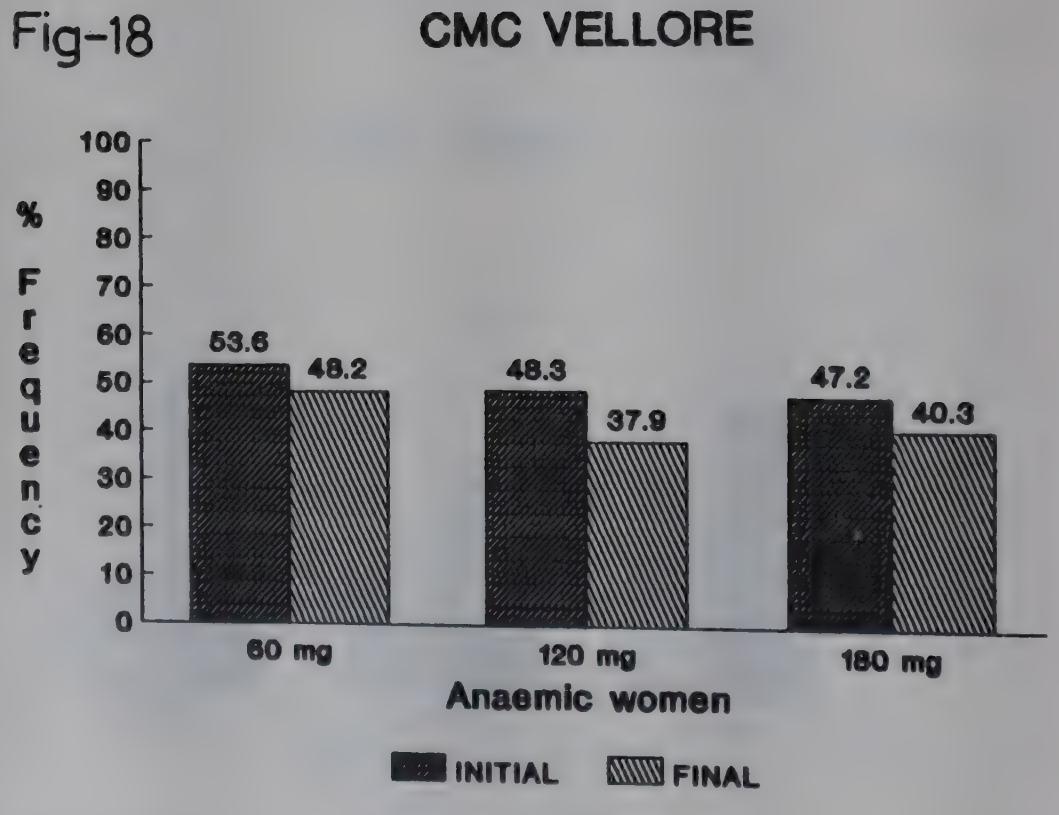

CMC VELLORE
53.6
48.2
48.3
37.9
47.2
40.3
% Frequency
100
90
80
70
60
50
40
30
20
10
0
60 mg
120 mg
180 mg
Anaemic women
INITIAL
FINAL

Fig-19

IMS VARANASI

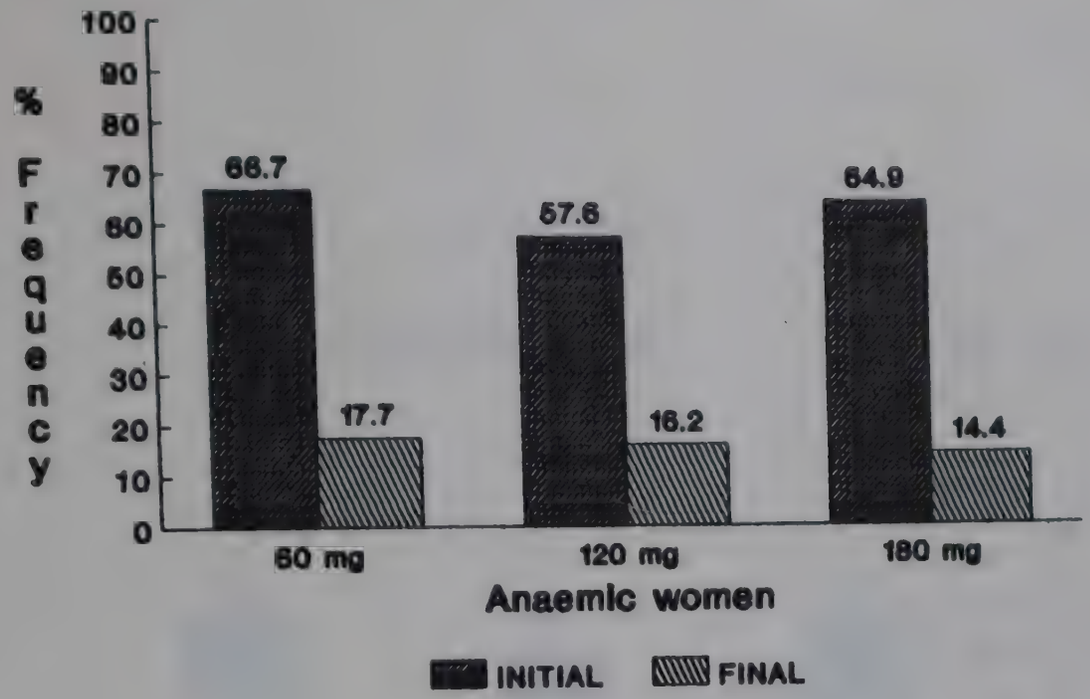


Fig-20

NIN HYDERABAD

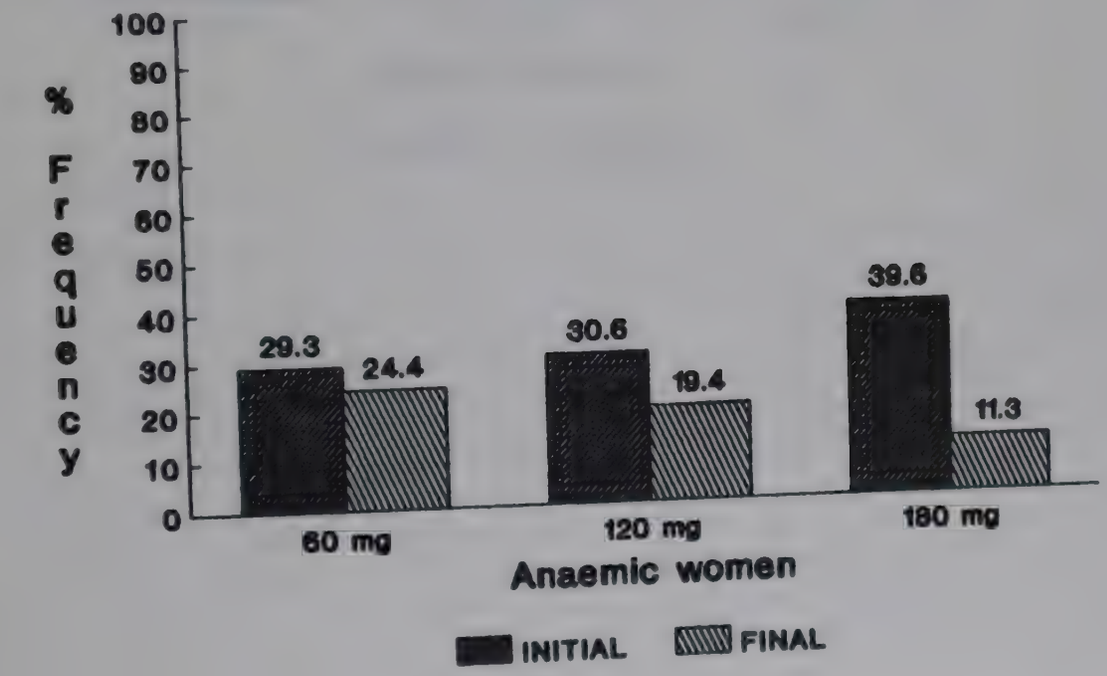


Fig-21

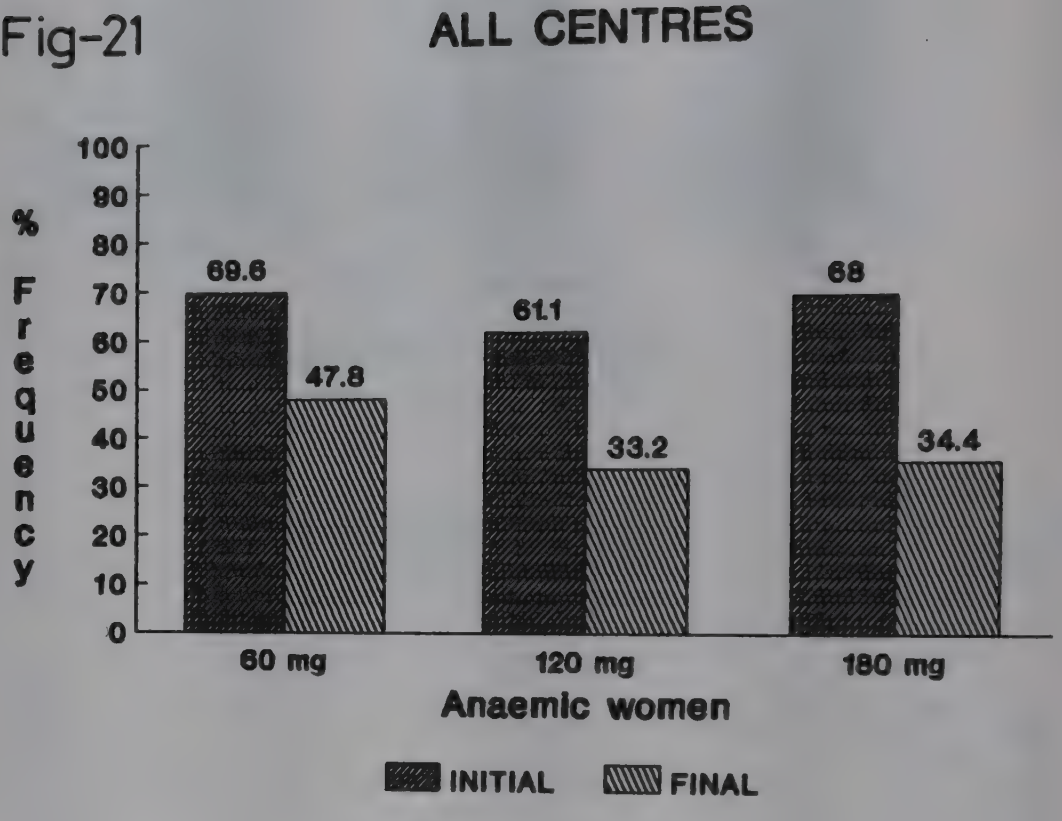

ALL CENTRES
% Frequency
100
90
80
70
60
50
40
30
20
10
0
69.6
47.8
61.1
33.2
68
34.4
60 mg
120 mg
180 mg
Anaemic women
INITIAL
FINAL

Table 07. Proportion of anaemic pregnant women before and after supplementation

Centre/Supplement group		Total subjects (n)	Anaemic Subjects at entry		Anaemic Subjects after supplementation	
			no.	%	no.	%
AIIMS NEW DELHI	G_1	31	29	93.5	26	83.9
	G_2	30	28	93.3	19	63.3
	G_3	37	36	97.3	26	70.2
UCMS DELHI	G_1	27	18	66.7	12	44.4
	G_2	36	17	47.2	9	25.0
	G_3	32	21	65.6	6	18.8
RNTMC UDAIPUR	G_1	71	71	100.0	62	87.3
	G_2	70	68	97.1	40	57.1
	G_3	72	72	100.0	43	59.7
CMC VELLORE	G_1	56	30	53.6	27	48.2
	G_2	58	28	48.3	22	37.9
	G_3	72	34	47.2	29	40.3
IMS VARANASI	G_1	96	64	66.7	17	17.7
	G_2	99	57	57.6	16	16.2
	G_3	97	63	64.9	14	14.4
NIN HYDERABAD	G_1	41	12	29.3	10	24.4
	G_2	62	19	30.6	12	19.4
	G_3	53	21	39.6	6	11.3
ALL CENTRES	G_1	322	224	69.6	154	47.8
	G_2	355	217	61.1	118	33.2
	G_3	363	247	68.0	125	34.4

4.4 Effect of different treatment regimens on haemoglobin values.

The dropout rates in some of the centres were very high and the compliance very poor. To study the efficacy of different supplement regimens it was considered necessary that only those subjects be included in the study who have consumed 90 or more doses of the supplement. As the rise in haemoglobin concentration is inversely proportional to the initial haemoglobin level and as there were significant differences in the mean initial haemoglobin level among different centres, (though the differences between mean haemoglobin values in different supplement groups within each centre were not significantly different) it was decided to perform an analysis of covariance (Table 08 and Annexure I). The regressions of final haemoglobin level on initial levels were at variance in different supplement groups and in different centres. The regression coefficients among different supplement groups did not show any significant difference in any centre. The pooled data from all the centres show the difference in slopes of regression lines and these are statistically highly significant ($F = 5.54$, $p < 0.001$). These regression lines alongwith the predicted haemoglobin concentration after interventions according to the intital haemoglobin concentrations are presented in Table 09 and Figs. 22 to 28 for all the centres and for pooled sample. In AIIMS, New Delhi and UCMS Delhi, the number of subjects in each individual group being very small, there may be higher probability of error.

Table 08. Comparison of regression lines and adjusted means of haemoglobin values amongst 3 groups of treatment viz. 60 mg, 120 mg and 180 mg of iron with 500 μg of folic acid

Centre/Source of variation	Degrees of freedom (DF)	$\Sigma(X-\bar{X})^2$	$\Sigma(X-\bar{X})(Y-\bar{Y})$	$\Sigma(Y-\bar{Y})^2$	Regression Coefficient	Deviation from Regress DF	SS	MS
AIIMS NEW DELHI								
Within supplement groups								
G1 (60 mg)	30	25.34	13.72	15.65	0.54	29	8.22	0.28
G2 (120 mg)	29	15.98	4.83	11.65	0.30	28	10.19	0.36
G3 (180 mg)	36	20.33	6.14	9.12	0.30	35	7.27	0.21
						92	25.68	0.28
Pooled within groups (W)	95	61.65	24.69	36.42	0.40	94	26.53	0.28
						2	0.86	0.43
Comparison between the slopes F = 1.53 NS								
Between groups (B)	2	2.76	2.52	5.57				
(W) + (B)	97	66.1	27.21	41.99		96	30.46	0.32
						2	3.97	1.98
Comparison between adjusted means F = 7.03***								
UCMS DELHI								
Within supplement groups								
G1 (60 mg)	26	60.54	27.65	66.97	0.46	25	54.34	2.17
G2 (120 mg)	35	61.97	14.92	62.49	0.24	34	58.89	1.73
G3 (180 mg)	31	32.62	-0.08	61.82	-0.0024	30	61.82	2.06
						89	175.05	1.97
Pooled within groups (W)	92	155.13	42.49	191.27	0.27	91	179.63	1.97
						2	4.58	2.29
Comparison between the slopes F = 1.17 NS								
Between groups (B)	2	9.47	5.58	5.26		93	182.49	1.96
(W) + (B)	94	164.69	48.08	196.53		2	2.86	1.43
Comparison between adjusted means F = 0.7241 NS								
RNTMC UDAIPUR								
Within supplement groups								
G1 (60 mg)	70	74.72	60.18	66.01	0.81	69	17.28	0.25
G2 (120 mg)	69	60.52	52.18	76.75	0.86	68	31.75	0.47
G3 (180 mg)	71	51.56	50.43	89.53	0.98	70	40.21	0.57
						207	89.24	0.43
Pooled within groups (W)	210	186.41	162.80	232.30	0.87	209	90.13	0.43
						2	0.89	0.44
Comparison between the slopes F = 1.01 NS								

e/ Source of variation	Degrees of freedom (DF)	$\Sigma(X-\bar{X})^2$	$\Sigma(X-\bar{X})(Y-\bar{Y})$	$\Sigma(Y-\bar{Y})^2$	Regression Coefficient	Deviation from Regression DF	SS	MS
een groups (B)	2	5.06	2.96	36.31		211	125.12	0.59
+ (B)	212	191.47	165.75	268.61		2	34.99	17.50
			Comparison between adjusted means F = 40.58***					
C VELLORE								
hin supplement groups								
60 mg)	55	88.17	47.71	104.76	0.54	54	78.95	1.46
120 mg)	57	141.54	83.09	127.00	0.59	56	78.22	1.40
180 mg)	71	135.08	60.26	138.68	0.45	70	111.80	1.60
						180	268.97	1.49
led within groups (W)	183	364.81	191.06	370.45	0.52	182	270.39	1.49
						2	1.41	0.70
			Comparison between the slopes F = 0.4711 NS					
ween groups (B)	2	4.62	0.45	3.26		184	274.43	1.49
) + (B)	185	369.41	191.51	373.71		2	4.04	2.02
			Comparison between adjusted means F = 1.36 NS					
IS VARANASI								
ithin supplement groups								
1 (60 mg)	95	173.15	95.03	113.81	0.55	94	61.65	0.66
2 (120 mg)	98	163.16	74.43	119.30	0.46	97	85.35	0.88
3 (180 mg)	96	150.29	65.91	113.39	0.44	95	82.48	0.87
						286	229.48	0.80
ooled within groups (W)	289	486.60	235.37	344.50	0.48	288	230.64	0.80
						2	1.17	0.58
			Comparison between the slopes F = 0.73 NS					
etween groups (B)	2	8.97	-1.54	0.30		290	234.46	0.81
W) + (B)	291	495.57	233.83	344.80		2	3.82	1.91
			Comparison between adjusted means F = 2.38*					
IN HYDERABAD								
Within supplement groups								
G1 (60 mg)	40	96.17	30.21	94.06	0.31	39	84.57	2.17
G2 (120 mg)	61	111.25	7.44	104.93	0.07	60	104.43	1.74
G3 (180 mg)	52	68.26	-5.11	85.03	-0.07	51	84.65	1.66
						150	273.65	1.82
Pooled within groups (W)	153	274.68	32.54	284.02	0.12	152	280.18	1.84
						2	6.52	3.26
			Comparison between the slopes F = 1.79 NS					

Centre/Source of variation	Degrees of freedom (DF)	$\Sigma(X-\bar{X})^2$	$\Sigma(X-\bar{X})(Y-\bar{Y})$	$\Sigma(Y-\bar{Y})^2$	Regression Coefficient	Deviation from Reg DF	Deviation from Reg SS
						154	283.06
Between groups	2	9.18	-3.40	2.02		2	2.88
(W+B)	155	284.87	29.45	286.04			
Comparison between adjusted means F = 0.78 NS							
POOLED DATA							
Within supplement groups							
G_1 (60 mg)	321	785.19	493.19	725.57	0.63	320	415.79
G_2 (120 mg)	354	761.27	383.71	621.59	0.50	353	428.19
G_3 (180 mg)	362	752.66	330.51	628.73	0.44	361	483.59
						1034	1327.57
Pooled within groups (W)	1037	2299.12	1207.41	1975.89	0.52	1036	1341.81
						2	14.24
Comparison between slopes F = 5.54**							
Between groups (B)	2	20.72	19.61	27.87		1038	1354.77
(W) + (B)	1039	2319.84	1224.02	2003.77		2	12.96
Comparison between adjusted means F = 5.00**							

NS = not significant *p<0.05 **p<0.01 ***p<0.001

able 09. Estimated regression functions and expected mean haemoglobin concentration after ≥90 days of supplementation

re/ lement p		Regression Function	Expected mean Hb concentration (g/dl) after 90 or more doses of supplementation at initial Hb level of (g/dl)							
			7	8	9	10	11	12	13	14
MS	G_1	Y=10.0+0.54 (X-9.3)	8.8	9.2	9.8	10.4	10.9	11.5	12.0	12.5
V DELHI	G_2	Y=10.6+0.30 (X-9.6)	9.8	10.1	10.4	10.7	11.0	11.3	11.6	11.9
	G_3	Y=10.5+0.30 (X-9.3)	9.8	10.1	10.4	10.7	11.0	11.3	11.6	11.9
	Combined	Y=10.4+0.40 (X-9.4)	9.4	9.8	10.2	10.6	11.0	11.4	11.8	11.2
MS	G_1	Y=11.2+0.46 (X-10.1)	9.8	10.2	10.7	11.1	11.6	12.1	12.5	13.0
LHI	G_2	Y=11.6+0.24 (X-10.9)	10.7	10.9	11.1	11.4	11.6	11.9	12.1	12.3
	G_3	Y=11.7+(-0.0024) (X-10.6)	11.7	11.7	11.7	11.7	11.7	11.7	11.1	11.7
	Combined	Y=11.5+0.27 (X-10.6)	10.5	10.8	11.1	11.3	11.6	11.9	12.1	12.4
T MC	G_1	Y=9.8+0.81 (X-8.9)	8.3	9.1	9.9	10.7	11.5	12.3	13.1	13.9
AIPUR	G_2	Y=10.6+0.86 (X-9.2)	8.7	9.6	10.4	11.3	12.1	13.0	13.9	14.7
	G_3	Y=10.8+0.98 (X-8.8)	9.0	10.0	11.0	12.0	13.0	13.9	14.9	15.9
	Combined	Y=10.4+0.87 (X-9.0)	8.7	9.5	10.4	11.3	12.1	13.0	13.9	14.7
C	G_1	Y=11.3+0.54 (X-10.9)	9.2	9.7	10.3	10.8	11.4	11.9	12.4	13.0
LLORE	G_2	Y=11.7+0.59 (X-11.0)	9.3	9.9	10.5	11.1	11.7	12.3	12.9	13.5
	G_3	Y=11.4+0.45 (X-11.3)	9.5	9.9	10.4	10.8	11.3	11.7	12.2	12.6
	Combined	Y=11.5+0.52 (X-11.1)	9.3	9.9	10.4	10.9	11.4	12.0	12.5	13.0
S	G_1	Y=12.0+0.55 (X-10.2)	10.2	10.8	11.3	11.9	12.4	13.0	13.5	14.1
RANASI	G_2	Y=11.9+0.46 (X-10.6)	10.2	10.7	11.2	11.6	12.1	12.5	13.0	13.5
	G_3	Y=11.9+0.44 (X-10.4)	10.4	10.8	11.3	11.7	12.2	12.6	13.0	13.5
	Combined	Y=11.9+0.48 (X-10.4)	10.3	10.7	11.2	11.7	12.2	12.6	13.1	13.6
N	G_1	Y=12.1+0.31 (X-11.7)	10.6	10.9	11.3	11.6	11.9	12.2	12.5	12.8
DERABAD	G_2	Y=12.1+0.07 (X-11.3)	11.8	11.9	11.9	12.0	12.1	12.1	12.2	12.3
	G_3	Y=12.3+0.07 (X-11.3)	12.0	12.1	12.1	12.2	12.3	12.4	12.4	12.5
	Combined	Y=12.2+0.12 (X-11.4)	11.7	11.8	11.9	12.0	12.2	12.3	12.4	12.5
L	G_1	Y=11.2+0.63 (X-10.1)	9.2	9.9	10.5	11.1	11.8	12.4	13.0	13.7
NTRES	G_2	Y=11.5+0.50 (X-10.5)	9.7	10.2	10.7	11.3	11.8	12.3	12.7	13.2
	G_3	Y=11.5+0.44 (X-10.3)	10.0	10.5	10.9	11.4	11.8	12.2	12.7	13.1
	Combined	Y=11.4+0.52 (X-10.3)	9.7	10.2	10.7	11.2	11.8	12.3	12.8	13.3

The adjusted means of final haemoglobin values showed significant differences in AIIMS, New elhi, RNTMC, Udaipur and also in the combined samples. The regression co-efficients and adjusted ean values are shown in Table 10.

REGRESSION LINES OF FINAL HAEMOGLOBIN ON INITIAL HAEMOGLOBIN LEVEL IN THE 3 SUPPLEMENT GROUPS.

Fig-22 AIIMS NEW DELHI

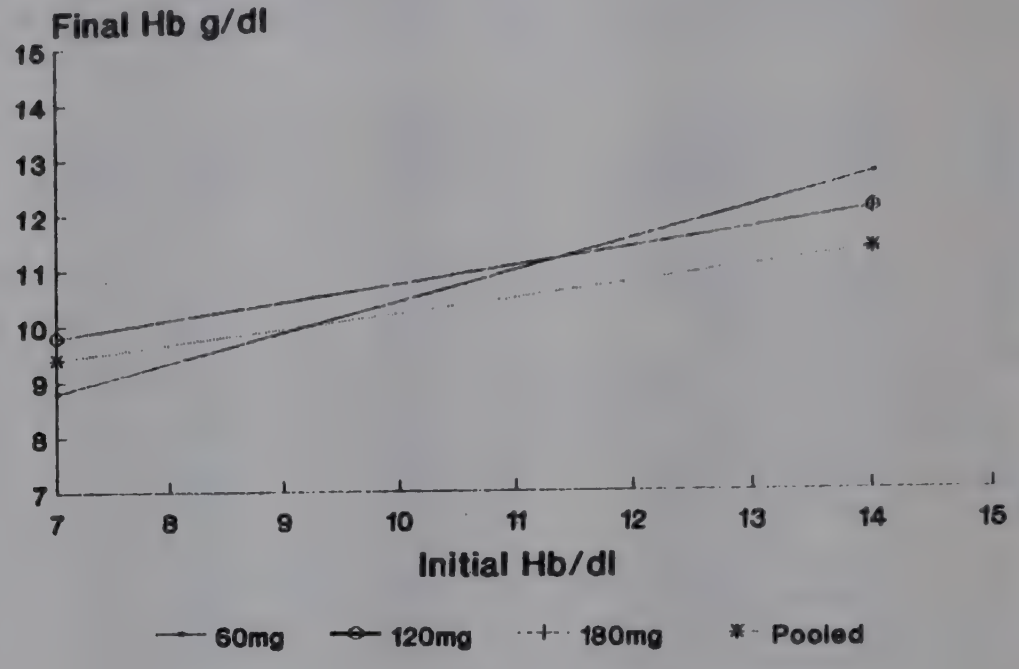


Fig-23 UCMS DELHI

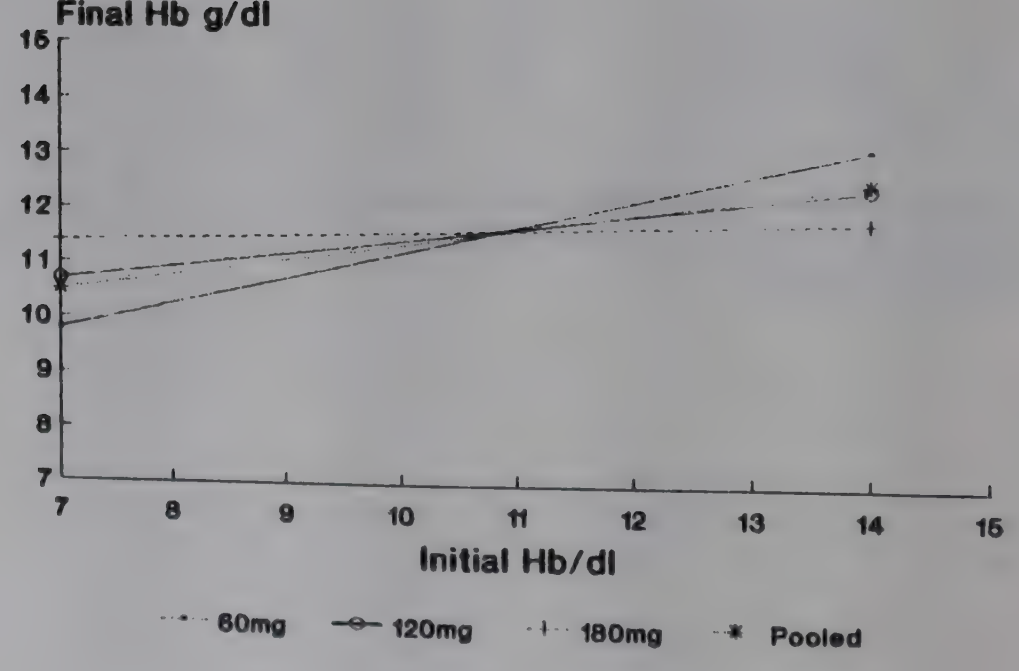


Fig-24 RNT MC UDAIPUR

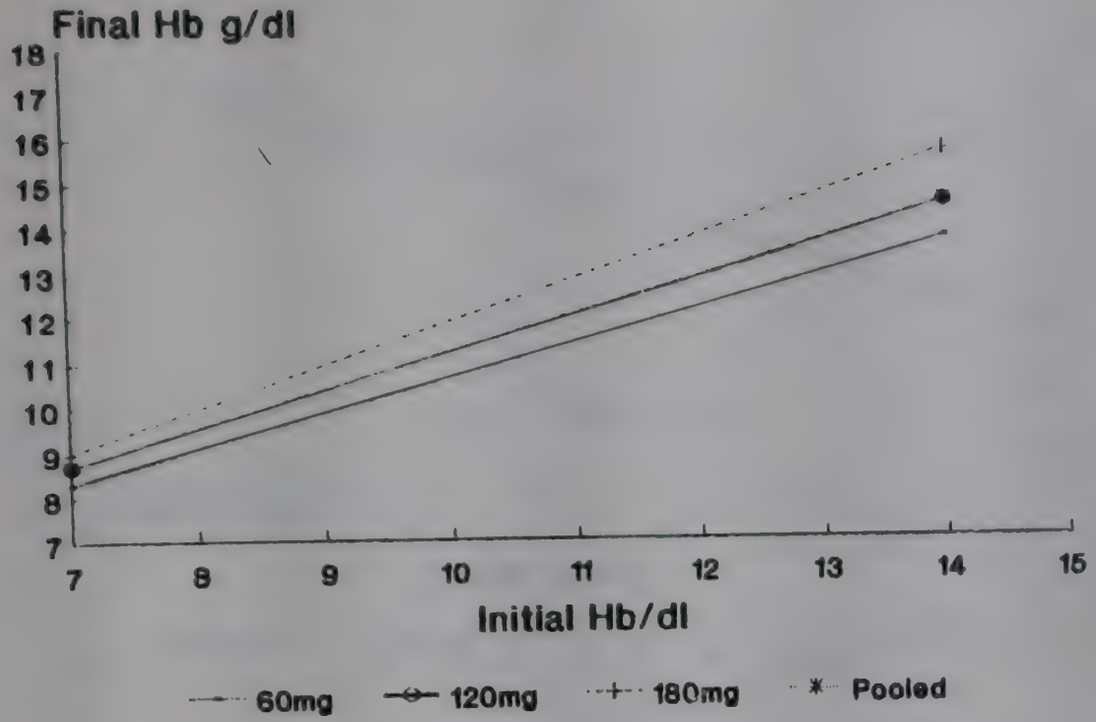
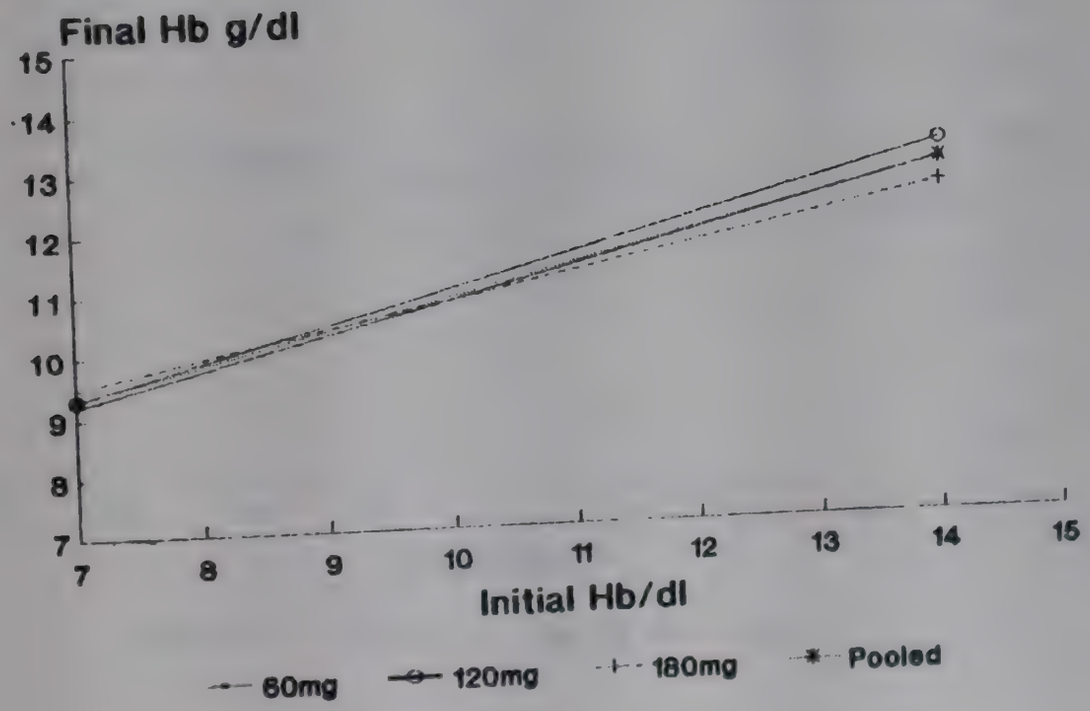


Fig-25 CMC VELLORE



WH-105

Fig-26

IMS VARANASI

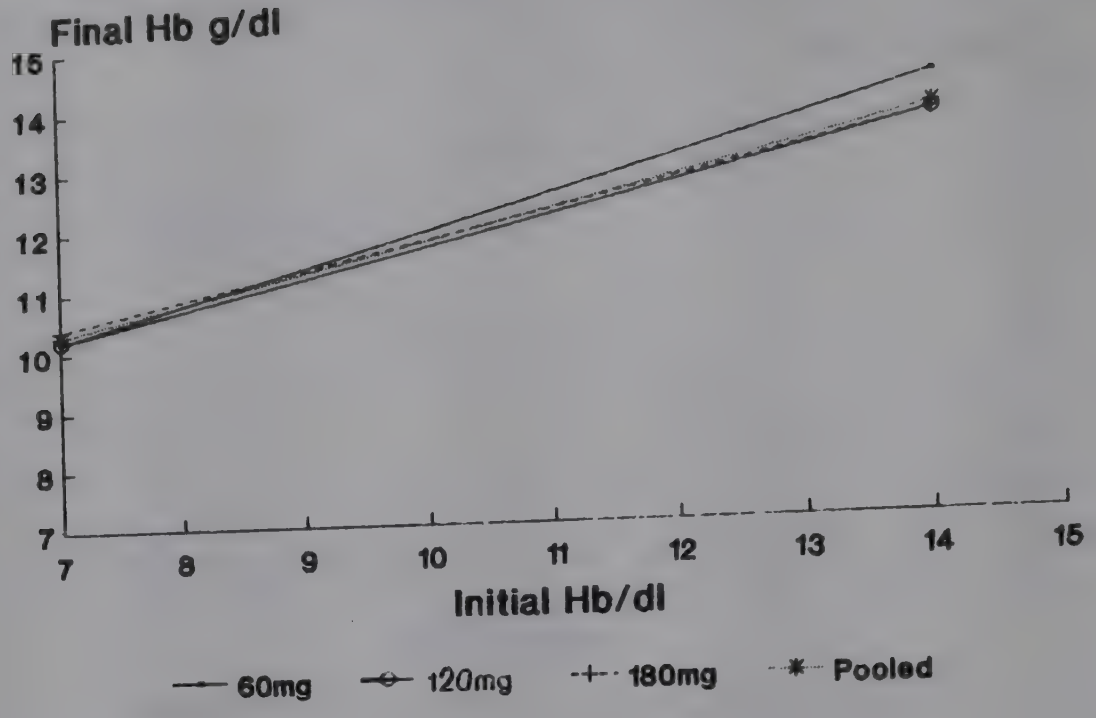


Fig-27

NIN HYDERABAD

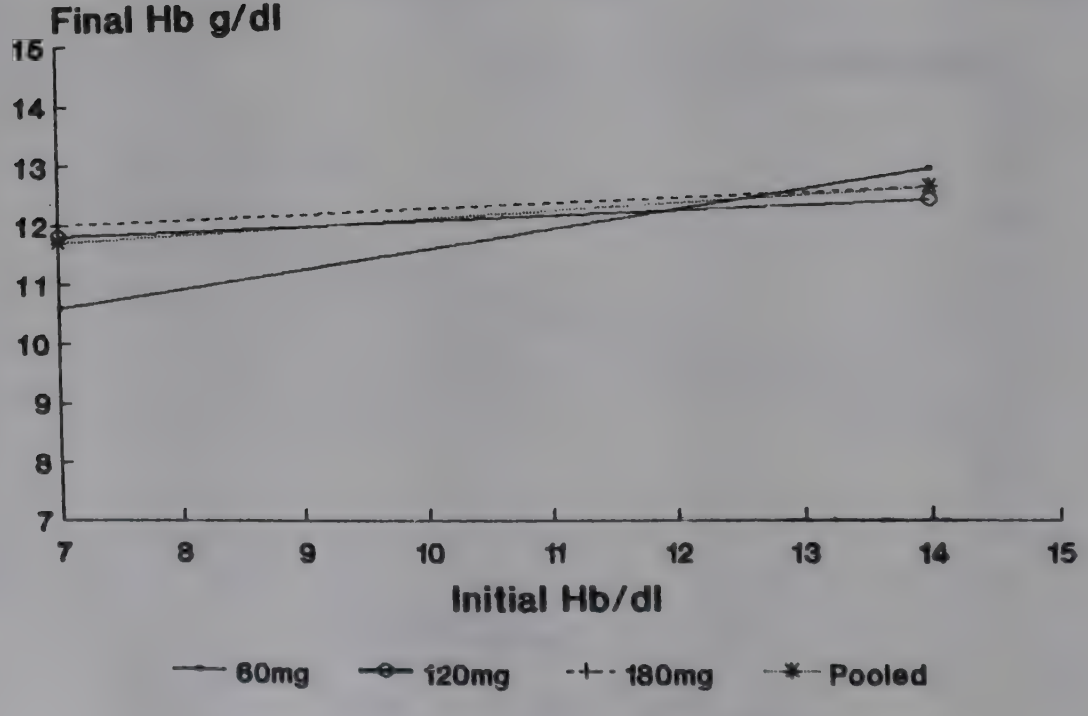
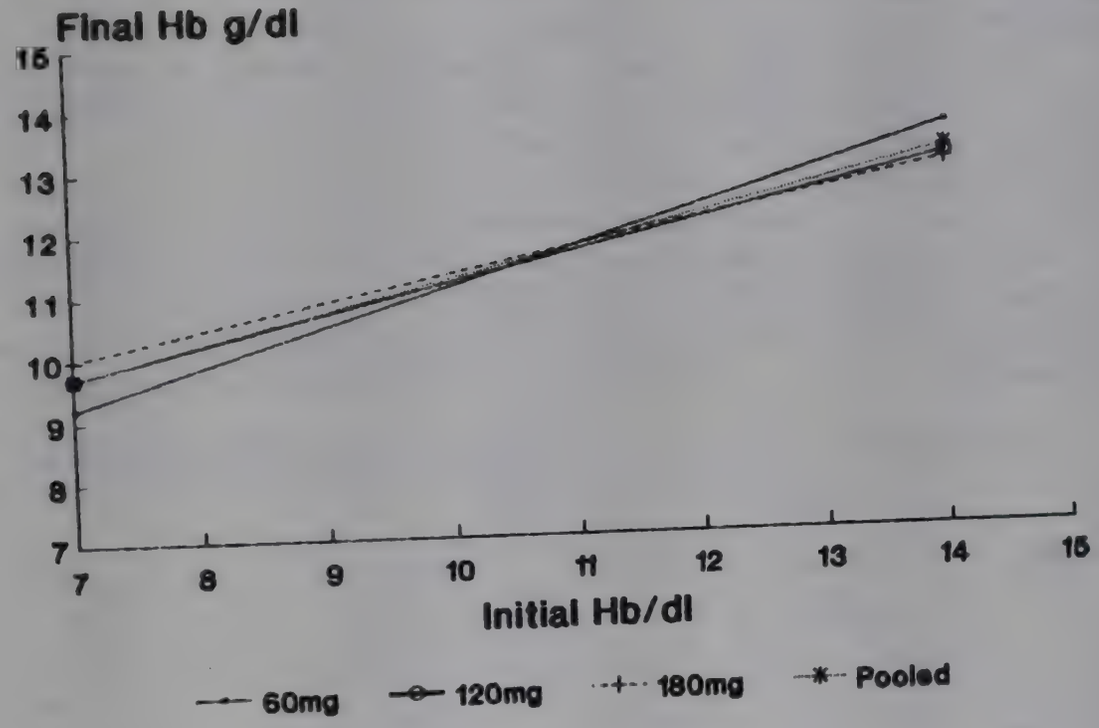


Fig-28

ALL CENTRES



4.5 Probablity of response

Table 11 shows the number of pregnant women showing a rise in haemoglobin concentrati following supplementation in women with whom the compliance was over 90 tablets in all the groups. The probability of response seems to be similar in all the 3 groups. However, the probabili of response is higher with lower initial haemoglobin values. Interestingly, a few women with init haemoglobin value of 13 g/dl or higher showed a rise in haemoglobin. This suggests th haemoglobin values in Indian pregnant women reach the same level as in the western women adequate iron supplementation is provided. This pattern also shows that consumption of tablets w significant even though errors in compliance cannot be excluded.

Table 10. The regression coefficients and adjusted means of final haemoglobin values in the 3 supplement groups in each centre

Centre/ Supplement	n	Regression Coefficient	F ratio	Adjusted mean	F ra
AIIMS, NEW DELHI					
G_1	31	0.54		10.09	
G_2	30	0.30	1.53	10.50	7.03
G_3	37	0.30		10.54	
Combined	98	0.40			
UCMS, DELHI					
G_1	27	0.46		11.30	0.7
G_2	36	0.24	1.17	11.55	
G_3	32	-0.0024		11.74	
Combined	96	0.27			
RNTMC, UDAIPUR					
G_1	71	0.81		9.89	
G_2	70	0.86	1.01	10.41	40.58
G_3	72	0.98		10.88	
Combined	213	0.87			
CMC, VELLORE					
G_1	56	0.54		11.42	
G_2	58	0.59	0.47	11.68	1.3
G_3	72	0.45		11.33	
Combined	186	0.52			
IMS, VARANASI					
G_1	96	0.55		12.07	
G_2	99	0.46	0.73	11.79	2.3
G_3	97	0.44		11.92	
Combined	292	0.48			
NIN, HYDERABAD					
G_1	41	0.31		12.03	0.7
G_2	62	0.07	1.79	12.09	
G_3	53	0.07		12.35	
Combined	156	0.12			
ALL CENTRES					
G_1 (60 mg)	322	0.63		11.23	
G_2 (120 mg)	355	0.50	5.54***	11.40	5.0***
G_3 (180 mg)	363	0.44		11.51	
Combined	1040	0.52			

*** $p < 0.001$

Table 11. Number of pregnant women showing rise in haemoglobin at different levels of initial haemoglobin concentration after supplementation

Initial Hb level g dl	60 mg group(G_1)			120 mg group(G_2)			180 mg group(G_3)		
	N	No. shown rise in Hb	Prob. of rise	N	No. shown rise in Hb	Prob. of rise	N	No. shown rise in Hb	Prob. of rise
7.0-8.9	79	75	0.95	48	47	0.98	73	71	0.97
9.0-10.9	145	120	083	169	147	0.87	174	158	0.91
11.0-12.9	81	54	0.67	124	80	0.64	106	71	0.67
13.0-13.9	14	6	0.42	12	7	0.58	9	2	0.22
14.0-14.9	2	—	0	2	—	0	1	—	0
Total	322	255	0.79	355	281	0.79	363	302	0.83

4.6 Serum ferritin

Because of wide range of serum ferritin values, the analysis was carried out after log transformation of the values. Table 12 shows rise in the mean serum ferritin values following supplementation in all the 3 groups. The samples from CMC Vellore, AIIMS New Delhi, UCMS, Delhi and IMS, Varanasi were analysed in one laboratory and therefore the differences in results of rise in serum ferritin were not due to differences in technique. The samples from IMS were mostly after supplementation and only 8 samples had initial i.e. pre-therapy value. These were not considered for analysis of serum ferritin values. Further, interprepation of data on serum ferritin was difficult because the identification of the subject was not provided. Therefore, it was not possible to correlate the rise in serum ferritin values with the status of compliance as well as haemoglobin level. It is possible that most of the samples are from the women in whom the consumption of tablets was low. The NIN centre analysed its samples in their own laboratory.

Table 12. Initial and final mean of log of serum ferritin and mean of individual differences

Centre/ Supplement	n	Mean		Mean individual log differences	S.E.	Paired 't'
		Initial	Final			
AIIMS, NEW DELHI						
G1	24	1.11±0.41	1.34±0.32	0.23	0.08	2.88**
G2	15	1.25±0.38	1.48±0.33	0.22	0.08	2.93**
G3	26	1.16±0.36	1.49±0.28	0.33	0.08	4.13**
UCMS, DELHI						
G1	39	0.73±0.30	0.81±0.32	0.08	0.06	1.29
G2	38	1.10±0.32	1.05±0.46	-0.05	0.07	-0.70
G3	28	0.76±0.27	0.91±0.39	0.15	0.09	1.58
CMC, VELLORE						
G1	10	0.91±0.43	1.56±0.39	0.65	0.17	3.82**
G2	12	1.07±0.40	1.56±0.39	0.49	0.13	3.76**
G3	15	1.10±0.46	1.66±0.34	0.56	0.08	7.00**
NIN, HYDERABAD						
G1	74	1.06±0.32	1.38±0.32	0.32	0.03	10.7**
G2	78	1.10±0.38	1.39±0.40	0.29	0.05	5.8**
G3	58	1.17±0.31	1.31±0.37	0.18	0.03	6.0**
ALL CENTRES						
G1	147	0.97±0.38	1.23±0.42	0.26	0.04	6.5**
G2	143	1.11±0.48	1.32±0.43	0.21	0.04	5.2**
G3	127	1.30±0.44	1.32±0.43	0.02	0.04	0.5

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Pretherapy and post therapy serum ferritin values in all the samples in which it was analysed ranged from 1-350.0 μg/l and 1.1-610.0 μg/l with mean ± SD as 16.0±18.88 μg/l and 30.0±44.4 μg/l respectively. Of these, 44.9 per cent and 30.1 percent had serum ferritin values less than 12 μg/l respectively. It indicates a rise in mean values in the post-therapy samples and 14.8 percent decrease in the number of subjects with iron deficiency status (serum ferritin<12 μg/l).

Table 13. Serum ferritin values (μg/l)

Level (μg/l)	Initial (n = 739)	Final (n = 419)
Range	1.0-350.0	1.1-610.0
Mean	16.0	30.0
SD	18.88	44.4
% with values<12 μg/l	44.9 (332)	30.1 (126)

4.7 Haematocrit

The mean rise in haematocrit percentage due to supplementation was highly significant in all the supplementation groups and shows generally the same trend in change between any two supplement groups in all the centres as haemoglobin concentrations (Tables 14, 15).

Table 14. Comparison of regression lines and adjusted means of haematocrit values amongst 3 groups of supplement viz 60 mg, 120 mg and 180 mg of iron with 500 μg of folic acid

Centre/ Source of variation	Degrees of freedom (DF)	$\Sigma(X-\bar{X})^2$	$\Sigma(X-\bar{X})(Y-\bar{Y})$	$\Sigma(Y-\bar{Y})^2$	Regression Coefficient	Deviation from Regression		
						DF	SS	MS
AIIMS NEW DELHI								
Within supplement groups								
G1 (60 mg)	30	322.77	100.58	177.93	0.3116	29	146.59	5.0550
G2 (120 mg)	29	233.47	28.40	112.70	0.1216	28	109.24	3.9016
G3 (180 mg)	36	375.24	109.41	109.68	0.2916	35	77.78	2.2222
						92	333.62	3.6263
Comparison between the slopes F = 0.7841 NS								
Pooled within groups (W)	95	931.48	238.39	400.31	0.2559	94	339.30	3.6096
Between groups (B)	2	32.52	59.19	107.90		96	416.35	4.3370
(W) + (B)	97	964.00	297.57	508.21		2	77.05	38.5247
Comparison between adjusted means F = 10.6728***								
UCMS DELHI								
Within supplement groups								
G1 (60 mg)	20	653.81	384.57	354.29	0.5882	19	128 08	6.7410
G2 (120 mg)	31	740.47	-30.34	529.72	-0.0410	30	528.48	17.6158
G3 (180 mg)	31	303.50	-28.75	511.87	-0.0947	30	509.15	16.9717
						79	1165.71	14.7558

entre/Source of variation	Degrees of freedom (DF)	$\Sigma(X-\bar{X})^2$	$\Sigma(X-\bar{X})(Y-\bar{Y})$	$\Sigma(Y-\bar{Y})^2$	Regression Coefficient	Deviation from Regression		
						DF	SS	MS
		Comparision between the slopes F = 5.6851***						
ooled within groups (W)	82	1697.78	325.48	1395.88	0.1917	81	1333.48	16.4627
etween groups (B)	2	145.21	145.80	165.36		83	1440.72	17.3580
W) + (B)	84	1842.99	471.28	1561.23		2	107.23	53.6168
		Comparison between adjusted means F = 3.2569**						
RNTMC UDAIPUR								
Within supplement groups								
G1 (60 mg)	70	721.58	545.23	611.75	0.7556	69	199.78	2.8953
G2 (120 mg)	70	737.89	537.39	762.62	0.7283	69	371.24	5.3803
G3 (180 mg)	71	677.87	428.87	699.87	0.6327	70	428.54	6.1219
						208	999.55	4.8055
		Comparison between the slopes F = 0.6017 NS						
Pooled within groups (W)	211	2137.34	1511.50	2074.24	0.7072	210	1005.33	4.7873
Between groups (B)	2	23.78	-37.34	214.28		212	1282.97	6.0517
(W) + (B)	213	2161.12	1474.15	2288.52		2	277.64	138.8176
		Comparison between adjusted means F = 2.7764**						
CMC VELLORE								
Within supplement groups								
G1 (60 mg)	55	445.43	229.21	604.98	0.5146	54	487.03	9.0191
G2 (120 mg)	57	972.62	572.31	830.16	0.5884	56	493.39	8.8106
G3 (180 mg)	71	879.94	530.72	902.61	0.6031	70	582.52	8.3217
						180	1562.94	8.6830
		Comparison between the slopes F = 0.1408 NS						
Pooled within groups (W)	183	2297.99	1332.25	2337.75	0.5797	182	1565.39	8.6010
Between groups (B)	2	21.16	13.59	38.87		184	1595.61	8.6718
(W) + (B)	185	2319.15	1345.84	2376.62		2	30.22	15.1116
		Comparison between adjusted means F = 1.7569 NS						
IMS VARANASI								
Within supplement groups								
G1 (60 mg)	95	1506.96	901.23	980.99	0.5980	94	442.02	4.7023
G2 (120 mg)	98	1363.41	674.62	974.99	0.4948	97	641.19	6.6102
G3 (180 mg)	96	1265.63	543.20	850.14	0.4292	95	617.00	6.4947
						286	1700.21	5.9448

Centre/ Source of variation	Degrees of freedom (DF)	$\Sigma(X-\bar{X})^2$	$\Sigma(X-\bar{X})(Y-\bar{Y})$	$\Sigma(Y-\bar{Y})^2$	Regression Coefficient	Deviation from Regressio DF	SS	MS
Comparison between the slopes F = 1.7921								
Pooled within groups (W)	289	4136.00	2119.05	2806.12	0.5123	2881	1720.45	5.9738
Between groups (B)	2	141.22	4.72	1.56		290	1753.17	6.0454
(W) + (B)	291	4277.22	2123.77	2807.69		2	32.73	16.363
Comparison between adjusted means F = 2.7392**								
NIN HYDERABAD								
Within supplement groups								
G1 (60 mg)	40	418.03	193.59	562.02	0.4632	39	473.38	12.137
G2 (120 mg)	61	919.18	286.09	603.87	0.3112	60	514.82	8.5803
G3 (180 mg)	52	561.17	91.59	460.79	0.1632	51	445.84	8.7420
						150	1434.04	9.5603
Comparison between the slopes F = 1.1366 NS								
Pooled within groups (W)	153	1898.39	571.27	1627.63	0.3009	152	1455.77	9.5775
Between groups (B)	2	5.83	15.27	61.94		154	1508.96	9.7984
(W) + (B)	155	1904.22	586.53	1689.62		2	53.18	26.590
Comparison between adjusted means F = 2.7764**								

NS-Not Significant, **p< 0.01, ***p< 0.001

Table No. 15 (a) Mean initial and final and mean individual differences of haematocrit values in the 3 supplement groups

Centre/ Supplement group		n	Initial mean±SD	Final mean±SD	Mean of individual differences	S.E. of mean of individual differences	t (paired t test) sig. at p
AIIMS NEW DELHI	G_1	31	27.68±3.28	30.26±2.44	2.58	0.57	<0.001
	G_2	30	29.13±2.84	32.90±1.97	3.77	0.58	<0.001
	G_3	37	28.49±3.23	31.81±1.75	3.32	0.45	<0.001
UCMS DELHI	G_1	21	29.90±5.72	32.29±4.21	2.38	0.75	<0.01
	G_2	32	32.28±4.89	35.59±4.13	2.31	1.16	<0.05
	G_3	32	32.13±3.13	35.44±4.06	3.31	0.94	<0.01
RNTMC UDAIPUR	G_1	70	27.45±3.21	30.49±2.96	3.04	0.22	<0.001
	G_2	71	27.62±3.25	32.19±3.32	4.56	0.30	<0.001
	G_3	72	26.88±3.09	32.88±3.14	6.00	0.32	<0.001
CMC VELLORE	G_1	56	33.21±2.85	34.73±3.32	1.52	0.44	<0.01
	G_2	58	33.76±4.13	35.88±3.81	2.12	0.45	<0.001
	G_3	72	34.03±3.52	35.14±3.57	1.11	0.38	<0.01
IMS VARANASI	G_1	96	30.77±3.98	36.01±3.21	5.24	0.27	<0.001
	G_2	99	32.38±3.73	36.01±3.15	3.63	0.32	<0.001
	G_3	97	32.06±3.63	36.17±2.98	4.10	0.33	<0.001
NIN HYDERABAD	G_1	41	33.26±3.23	35.22±3.75	1.95	0.60	<0.01
	G_2	62	33.31±3.89	36.26±3.15	2.95	0.50	<0.001
	G_3	53	33.70±3.29	36.85±2.89	3.15	0.55	<0.001
ALL CENTRES	G_1	315	30.43±4.31	33.63±4.07	3.20	0.33	<0.001
	G_2	352	31.62±4.48	34.96±3.33	3.29	0.25	<0.001
	G_3	363	31.31±4.34	34.90±3.39	3.59	0.39	<0.001

4.8 Mean Corpuscular Haemoglobin Concentration (MCHC)

The mean initial and final Mean Corpuscular Haemoglobin Concentration (MCHC), mean individual differences, its standard error and the level of significance are shown in Table 16. The final mean MCHC were significantly higher than the initial mean MCHC in all the supplement groups in IMS, Varanasi. In no other centre difference was statistically significant with a few exceptions. However, the initial and final MCHC levels were around the normal limit of 32-34 percent in all the 3 dose supplement groups in almost all the centres.

4.9 Side effects

Most commonly observed side effects were gastritis and nausea/vomiting. Diarrhoea and constipation were reported in a very small proportion of subjects.

Table No. 16. Mean initial and final mean corpuscular haemoglobin concentration (g/d) and mean individual differences with level of significance

Centre	Supplement group	n	Initial MCHC Mean ± SD	Final MCHC Mean ± SD	Mean Individual Difference	Standard error	Paired 't'	Level of significance
UCMS DELHI	G1	20	31.97±1.19	32.41±1.90	0.44	0.43	1.02	NS
	G2	29	32.37±2.52	31.40±3.53	-0.98	0.67	-5.03	p<0.001
	G3	31	32.65±1.46	33.32±1.47	0.67	0.35	1.90	NS
RNTMC UDAIPUR	G1	71	32.21±1.69	32.07±1.13	-0.14	0.22	-0.65	NS
	G2	71	33.31±1.98	32.62±1.59	-0.39	0.24	-1.60	NS
	G3	74	33.01±2.15	33.71±1.18	-0.29	0.26	-0.03	NS
IMS VARANASI	G1	43	33.04±0.99	33.60±0.70	0.56	0.17	3.24	p<0.01
	G2	43	33.05±1.14	33.60±1.13	0.55	0.14	3.98	p<0.001
	G3	55	32.55±1.00	33.32±1.11	0.67	1.17	4.24	p<0.001
NIN HYDERABAD	G1	41	35.38±3.49	34.10±3.36	-1.28	0.65	-1.96	p<0.05
	G2	60	34.35±4.43	33.58±3.25	-0.77	0.72	-1.07	NS
	G3	56	32.81±3.55	33.39±3.31	0.57	0.64	0.88	NS
ALL CENTRES	G1	175	33.12±2.53	32.96±2.12	-0.16	0.51	0.31	NS
	G2	205	33.32±2.50	32.94±2.54	-0.38	1.12	0.33	NS
	G3	216	32.81±2.36	33.47±1.97	0.66	0.21	2.85*	p<0.05

NORMAL MCHC 32-38%

Overall, side effects were reported highest in CMC Vellore centre in all the 3 supplement groups. In AIIMS New Delhi, UCMS Delhi and IMS Varanasi centres, the side effects recorded were lowest with 120 mg iron supplement as compared to 60 mg and 180 mg iron groups. In NIN centre, the proportion of subjects experiencing side effects with 120 mg iron was lower than that of 180 mg iron. Only in CMC Vellore centre, the highest proportion of subjects experienced side effects with 120 mg iron as compared to the other 2 doses (Table 17).

From these data it appears that at least in this study, the side effects are not consistent between dose levels of 60 mg, 120 mg and 180 mg in different centres. However, in combined sample of 5 centres, it was observed that there was no significant difference in the proportion of subjects in 60 mg and 120 mg groups experiencing side effects though subjects experiencing side effects with 180 mg. dose were significantly higher in proportion.

Table No. 17. Side effects with different dose supplement

Centre		Side effect (% to N)						
		Nausea Vomiting	Gastritis Dysentery	Diarrhoea	Constipation	Abdominal Distension	Total	N
AIIMS NEW DELHI	G_1	2	7	—	—	4	10	46
	%	4.35	15.22			8.70	21.74	
	G_2	—	1	—	—	2	3	45
	%		2.22			4.44	6.67	
	G_3	10	12	—	—	—	17	67
	%	14.93	17.91				25.37	
UCMS DELHI	G_1	13	5	2	—	—	20	146
	%	8.90	3.42	1.37			13.70	
	G_2	10	—	3	—	—	11	168
	%	5.95		1.79			6.55	
	G_3	18	1	3	—	2	23	164
	%	10.98	0.61	1.83		1.22	14.02	
RNTMC UDAIPUR				Not Recorded				
CMC VELLORE	G_1	2	22	1	1	—	23	97
	%	2.06	22.68	1.02	1.03		23.71	
	G_2	20	34	—	3	—	42	119
	%	16.80	28.57		2.52		35.29	
	G_3	21	18	3	—	—	32	122
	%	17.21	14.75	2.46			26.23	
IMS VARANASI	G_1	1	3	—	1	—	5	97
	%	1.03	3.09		1.03		5.15	
	G_2		4	—	—	—	4	100
	%		4.00				4.00	
	G_3	11	9*	5	3	—	24	100
	%	11.00	9.00	5.00	3.00	—	24.00	
NIN HYDERABAD	G_1	11	2	1	1	—	14	127
	%	8.66	1.57	0.79	0.79		11.02	
	G_2	23		—	2	—	25	167
	%	13.77			1.20	—	15.97	
	G_3	18	1	3	—	—	22	101
	%	17.82	0.99	2.97	—	—	21.78	
ALL CENTRES	G_1	29	39	4	3	4	72	513
	%	5.6	7.6	0.8	0.6	0.8	14.0	
	G_2	53	39	3	5	2	85	599
	%	8.8	6.5	0.5	0.8	0.3	14.2	
	G_3	68	41	9	3	2	118	554
	%	12.2	7.4	1.6	0.5	0.4	21.3	

Total not additive due to multiple response, *Includes cases of blood vomiting, †Included 1 case of malena

DISCUSSION

The study shows that the prevalence of anaemia in pregnant women continues to be high even after 2 decades of initiation of NNAPP by the Government of India. The overall prevalence in this vulnerable group was 62.1 per cent. Iron with folate supplementation even without supervision has caused a significant rise in mean haemoglobin concentration with all the 3 regimens in all the centres when consumption of tablets was 90 or more. This also resulted in significant decrease in prevalence of anaemia. However, in 47.2 percent of cases the consumption of tablets was less than 90. There are striking differences in the number of dropouts and the degree of compliance from one centre to another. It is difficult to comprehend these differences. It is possible that these may be based on the differences in *a*) the KAP of the population being studied or *b*) amount of effort made by the working team to motivate the subjects in consumption of tablets. However, this high dropout and non-compliance rate (47.2%) and the significantly low consumption are serious constraints in the success of any national programme for control of anaemia through iron supplementation in pregnant women which is the most vulnerable population group. For success of such a programme, involvement of paramedical workers at the grass-root level is essential. Therefore, in designing of national strategies, attention should be paid to increase awareness of the target groups, improve the delivery system and adequately educate health workers at all levels

It remains a matter of concern that a significant proportion of pregnant women with reported consumption of 90 or more tablets had haemoglobin levels less than 10 g/dl (37.8 per cent) and as many as 19.4 per cent had haemoglobin concentration less than 9 g/dl. It is possible that reported compliance is not absolutely correct or these women require to receive iron for a much longer period.

Rise in serum ferritin values after supplementation had demonstrated that the iron stores improve, though a large number of women continue to be in the iron deficient range (serum ferritin < 12 μg/l) exposing them to risk of iron deficiency, specially at subsequent pregnancy.

6. RECOMMENDATIONS

6.1 Control of anaemia

It is essential that anaemia prevention and control programme is implemented effectively through the existing health and ICDS infrastructure.

6.2 Dose of iron and folic acid

As already discussed, the dose response in this study has not shown consistent result in all the centres, though mean rise in haemoglobin level after intervention was significantly high in all the supplement regimens in all the centres. The adjusted mean also showed significant rise in each supplement regimen in the combined sample. The mean rise in haemoglobin in the pooled sample was higher with 120 mg and 180 mg though adjusted mean was highest in 180 mg group of women among the three groups.

The reduction in the proportion of anaemic pregnant women was however significantly higher in 120 mg and 180 mg group of women as compared to 60 mg group. Between 120 mg and 180 mg group, there were no significant differences in all centres as well as in the pooled sample. The side-effects were also not consistent from centre to centre. The findings of the supervised study of different doses of iron and folic acid, adjudged with the finding of the present study in the overall, suggest 120 mg of iron with 500 μg of folic acid given daily as optimim prophylaxis dose of supplement to pregnant women as soon as pregnancy is detected. However, considering minimum side effects and efficacy in raising haemoglobin level the 60 mg dose may also prove efficient in control of anaemia.

6.3 Monitoring and health education

The most important part of the programme should be the supervision of compliance. To achieve this, the functionaries at the grass root level, are to be properly trained alongwith effective monitoring of the programme.

It is most important that KAP of the population are raised through health education programme. In this study, the need for such measures is clearly demonstrated.

6.4 Severe anaemia

Severe anaemic cases have been excluded from the study. For these cases (haemoglobin <7 g/dl) it is recommended that health workers are trained to identify such cases on the basis of clinical signs and refer them to the PHC medical officer.

6.5 Delivery System

Delivery system of supplements needs to be carefully reviewed. Role of functionaries in motivating the beneficiaries has to be ensured.

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Annexure I

The linear model of analysis of co-variance is

$$Yij = \mu i + \beta(Xij - \bar{X}..) + \epsilon ij$$

Where

Yij = Post supplementation haemoglobin level in jth subject in ith supplement group.

μi = The effect due to ith treatment.

β = Regression co-efficient of Y on X.

Xij = Pre-supplementation haemoglobin level in jth subject in the ith group.

$\bar{X}$..= Pre-supplementation mean haemoglobin level of all subjects.

ϵij = A random error term.

The value of β is estimated by

$$b = \frac{\Sigma(X - \bar{X})(Y - \bar{Y})}{\Sigma(X - \bar{X})^2}$$

The term $[-\beta(\bar{X}_i . - \bar{X}..)]$ is the adjustment to remove the effects of differences in the intitial haemoglobin levels in the ith supplement group.

The adjusted mean i.e. mean post-supplementation haemoglobin level after adjustment for differences in pre-supplementation haemoglobin level, represented by α_i for ith supplement group is

$$\alpha_i = \bar{Y}_i - b(\bar{X}_i - \bar{X})$$

Where $\bar{Y}$i and $\bar{X}$i are the post and pre supplementation mean haemoglobin levels in ith supplement group.

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